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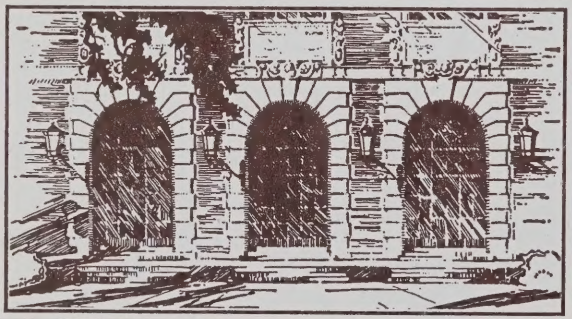

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Loess soils of northwest illinois

Bulletin 739

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Loess Soils of Northwest Illinois

The soils of northwestern Illinois are formed primarily in Peorian loess of varying thickness on glacial tills of differing age and composition, outwash materials of different textures, wind- and water-deposited sand, and bedrock or rock residuum of limestone, sandstone, and shale. In areas where the loess is thinner than five to six feet the underlying materials are important in the genesis and classification of the soils. Where it is thicker than five or six feet, differences in the soils are related to character of the parent loess, slope of the land surface, depth to water table, and native vegetation. Because Peorian loess thicker than five feet covers more than two-thirds of the upland area of northwestern Illinois, the present study is devoted to the soils derived from this loess. The results are reported in this publication.

Purpose of the Study

The primary objectives of this study are:

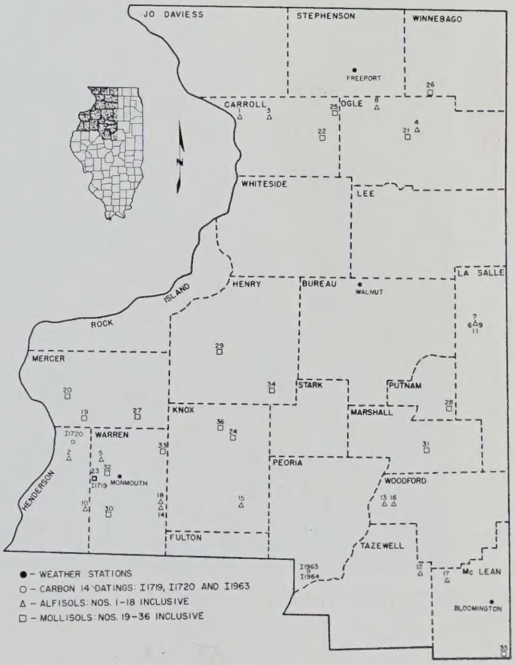
1. To determine the distribution of Peorian loess in northwestern Illinois and the nature of the underlying materials.
2. To measure thickness, extent, and direction of thinning of Peorian loess.
3. To determine the distribution of the important soils formed in loess thicker than five feet.
4. To characterize by physical and chemical laboratory analyses the important soils formed in Peorian loess.
5. To provide some mineralogical analyses of soils developed in Peorian loess in northwestern Illinois.
6. To provide through field descriptions and laboratory data a basis for the proper classification of these soils in northwestern Illinois and their correlation with similar soils in Iowa, Minnesota, Wisconsin, and possibly Missouri and other states.

Soils Studied

Thirty-six profiles of deep loess soils in northwestern Illinois were included in this study. The approximate location of each is shown in Figure 1. Locations of the Alfisols or light-colored soils are shown with a triangle (△) and those of the Mollisols or dark-colored soils are shown with a square (□). A number is also assigned to each profile. Numbers 1 to 18, inclusive, are assigned to the Alfisols and numbers 19 to 36, inclusive, are assigned to the Mollisols. These numbers are convenient in relating certain parts of the discussion in this bulletin to profile descriptions and data in the Appendix and to certain geologic features such as depth and source of the loessial parent materials (Figs. 1 and 2).

One to five profiles of each of 15 soil series were described, sampled, and analyzed in detail. The relationships of the 15 soils to each other in surface color and oxidation or natural drainage are shown in Table 1. Because Muscatine, Ipava, Tama, and Fayette soils are of major importance in northwestern Illinois, samples of five Muscatine profiles and four profiles each of Ipava, Tama, and Fayette were analyzed. Samples from one to three profiles of the remaining 11 series shown in Table 1 were analyzed.

Other deep loess soils that occur, but are of less importance and were not sampled, are listed in the text tables for Soil Associations 1, 2, and 3, pages 21 to 22.



Northwestern Illinois counties or portions of counties included in the field investigations for this study. The numbers 1 through 36 locate the sites at which detailed soil profile descriptions were written and samples were collected. The towns of Freeport, Walnut, Monmouth, and Bloomington, where rainfall and temperature data were taken, are shown. Also shown are the three locations where radiocarbon dating materials were collected. Material for I1964 was collected below I1963 in the same section. (Fig. 1)

Table 1. — Soil Profiles Studied: Soils in Northwestern Illinois Developed in Peorian Loess Thicker Than Five Feet[a]

Soil association areas[b]	Well oxidized	Moderately well oxidized	Imperfectly oxidized[c]	Poorly oxidized
		Light-colored soils (Alfisols)[d]		
1B	Seaton (1,2)			
2B	Fayette (3,4,5,6)	Rozetta (7)	Stronghurst (8,9,10)	Traer (11)
3B	Clary (12,13)	Clinton (14,15)	Keomah (16,17)	Rushville (18)
		Dark-colored soils (Mollisols)[d]		
1A		Joy (19)	Joy (20)	
2A	Tama (21)	Tama (22,23)	Muscatine (25,26,27,28,29)	Sable (30,31) Hartsburg (32)
3A	Tama (24)		Ipava (33,34,35,36)	

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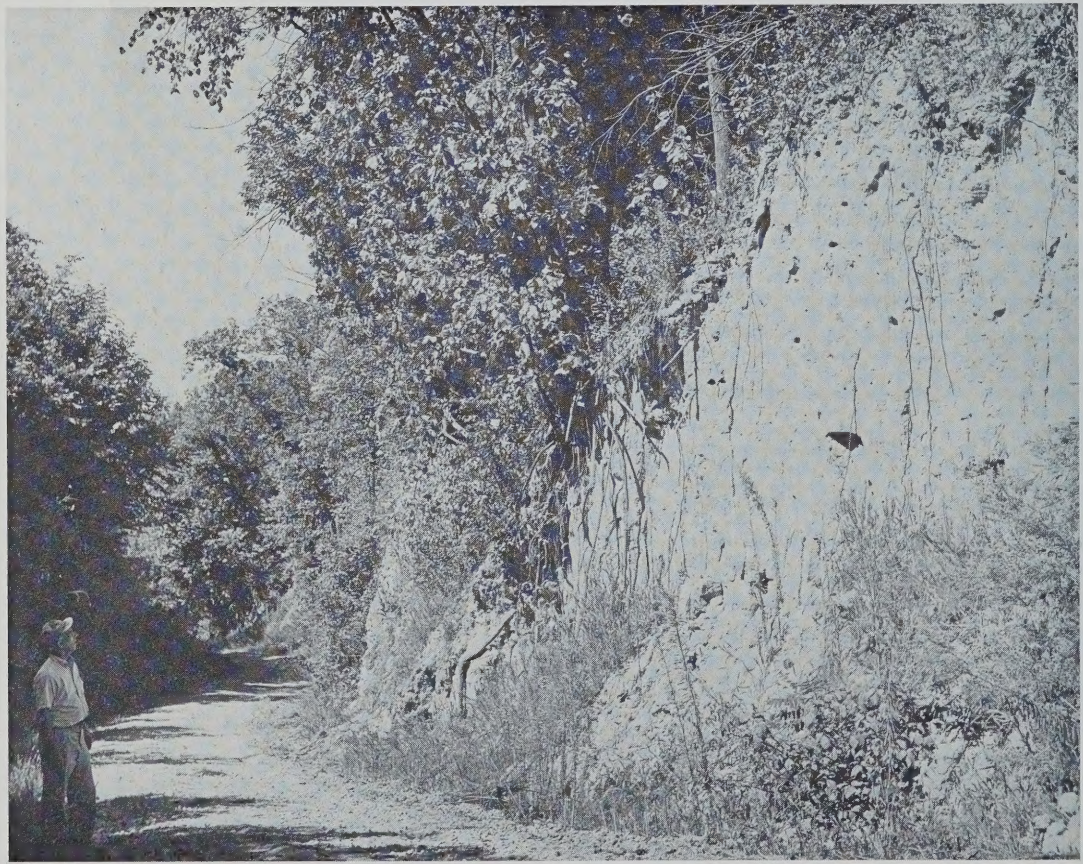
[a] Each soil profile studied is identified by a site number shown in parentheses.
[b] For delineation of association areas see colored Soil Association Map.
[c] In some soil descriptions "imperfectly" is replaced by "somewhat poorly."
[d] For details of classifying these soils see discussion on pages 55 to 60, and Table 16.



A 15-foot Peorian loess section in Henderson County showing typical vertical cleavage. (Fig. 2)

Review of Literature

Soils developed in Peorian loess are important to the economy of northwestern Illinois. The distribution and field characteristics, as well as the general physical, chemical, and mineralogical properties of the various soil types and their parent materials, are of interest and significance to those concerned with soils in the area.

Loess as an Earth Material

Deposits of loess have been noted in many parts of the world, but perhaps the best known and most extensive areas are found in China, Russia, the Rhine valley in Germany and France, and the Mississippi valley system in the central United States. Much has been written regarding the origin, distribution, and properties of loess. Many observers have attempted to define loess, but few definitions have been considered completely satisfactory without reference to its mode of origin.

Field characteristics of loess have been observed and recorded by workers in geology, soil science, geography, paleontology, archaeology, and perhaps many other areas of study. Russell (1944) searched the literature and located more than 700 reports of loess in books, articles, and abstracts that were then in print. Many others have been published since 1944. Only a few will be reviewed here.

Von Richthofen (1883), in a letter to Henry Woodward of the British Museum of Natural History, listed a number of petrographical, stratigraphical, and faunistic features in which loess, as he observed it, seemed to differ from other inorganic earth materials. These were (1) a nearly homogeneous composition and structure, (2) an area distribution independent of the lay of the land (he cited its occurrence in China where loess deposits range "from a few feet to about 8,000 feet" above sea level), (3) presence of angular grains of quartz, (4) absence of stratification, (5) tendency to vertical cleavage, (6) presence of capillary structures such as tubes and root holes, (7) presence of immense numbers of land shells, and (8) presence of preserved animal bones. Later authors in general have agreed with Von Richthofen's characterization, but have added other descriptive characteristics as follows: (9) unconsolidated, (10) porous, (11) ordinarily calcareous, (12) consists predominantly of silt-size particles, (13) ordinarily yellowish to buff in color, (14) molds easily in the fingers when wet, but crushes easily when dry, and (15) tendency to stand in vertical faces. To these features, most authorities, including Von Richthofen, have added the interpretation that loess is wind deposited. This mode of deposition, however, has been challenged by some investigators.

Peorian Loess

The term **Peorian** was first used (Leverett, 1899) to designate an interglacial interval between the then-assumed Iowan and Wisconsin glacial stages. The name became attached to a layer of loess found just beneath early Wisconsin (Shelbyville) till in the Farm Creek section a few miles east of the town of Peoria, Illinois. This layer of loess was assumed to have been deposited during the Peorian interglacial period, whereas loess occurring on top of Shelbyville till in the same section was assumed to have been deposited during the Wisconsinan of that time and was termed Wisconsin loess.

Later, Leighton (1931, 1933) established a close relationship of the so-called Iowan glacial to the Wisconsin and suggested that the Iowan become a substage of the Wisconsin. He also suggested that the above-mentioned layer of loess beneath Shelbyville till be known as **Iowan** and the loess occurring on top of such till be known as **Tazewell**. In a restudy of the whole classification of the Wisconsinan glacial stage in Illinois, Frye and Willman (1960) proposed the name **Morton** for the lower loess and **Richland** for the upper (Fig. 3). But, regardless of the names used for these units, the two deposits beyond the limits of Shelbyville drift are not identifiable as separate entities and it is this multiple loess, including possibly some of later Wisconsinan time, that is known as **Peorian** loess (Kay and Leighton, 1933, also Leighton and Willman, 1950) or as **Peoria** loess (Frye and Willman, 1960). The latter authors preferred not to use the adjectival ending for a rock-stratigraphic unit.

No complete detailed studies of entire sections of Peorian loess have been made. Smith (1942), analyzing samples from southwestern Illinois, found that in general mean particle size of calcareous loess decreased with increasing distance from source; that is, "the coarser fractions decrease in quantity, the finer fractions increase in quantity, and the intermediate fractions first increase and then decrease with distance from the bluff." He found that 1 to 2 percent was of sand size ($>50\mu$), except that more sand was present within about 1 or 1½ miles of the bluff face, and that this fraction was often more than one-half lime and iron-manganese concretions. He found that coarse silt ($20\text{-}50\mu$) ranged primarily between 50 and 65 percent, fine silt ($2\text{-}20\mu$) between 10 and 30 percent, and clay ($<2\mu$) between about 5 and 20 percent. He also found that the $CaCO_3$ equivalent (calcium plus magnesium carbonate) ranged primarily between 15 and 30 percent, although a few samples were slightly outside this range; and he found that the majority of the limestone and dolomite particles were in the 20 to 30 μ fraction.

Whiteside (1947), in a preliminary X-ray study of calcareous Peorian loess in Illinois, found from analyses of 5 composite samples that they ranged between 37 and 45 percent quartz, between 12 and 16 percent feldspar, between about 1 and 3 percent calcite, and between 12 and 29 percent dolomite. He further found that secondary lime concretions were more than 60 percent calcite and less than 12 percent dolomite.

Johnson (1961) reported the percentages of six mineral oxides in 62 samples of Peorian loess in Illinois. Of these 62 samples, 24 were from the area of the present study in the northwestern part of the state. Of the 24 samples, 12 noncalcareous samples were paired with 12 subjacent calcareous samples and all were fractionated into coarse silt (20-50μ) and fine silt (2-20μ). Johnson showed that the proportions of ZrO_2, TiO_2, and K_2O were higher in both coarse silt and fine silt fractions in all 12 noncalcareous samples, as compared with the paired calcareous samples, indicating that these minerals were accumulating at the expense of certain other minerals and could be interpreted as weathering more slowly than the others. Fe_2O_3 was higher in 11 of the 12 noncalcareous coarse silt samples and higher in all 12 noncalcareous fine silt samples compared with the paired calcareous samples. CaO, on the other hand, was much lower in all noncalcareous samples compared with the paired calcareous samples, indicating that this mineral is weathering rapidly under the prevailing climate. MnO varied, with 6 of 12 coarse silt and 8 of 12 fine silt noncalcareous samples being lower in MnO than the paired calcareous samples.

Alexander et al. (1962), in comparing the coarse silt fraction of 11 samples of calcareous loess from central and northwestern Illinois with 11 samples of calcareous till from northeastern Illinois, found that loess ranged from 0.047 to 0.071 percent zirconium, whereas till ranged from 0.011 to 0.028 percent or more than twice as much zirconium in Peorian loess as in Wisconsinan till.

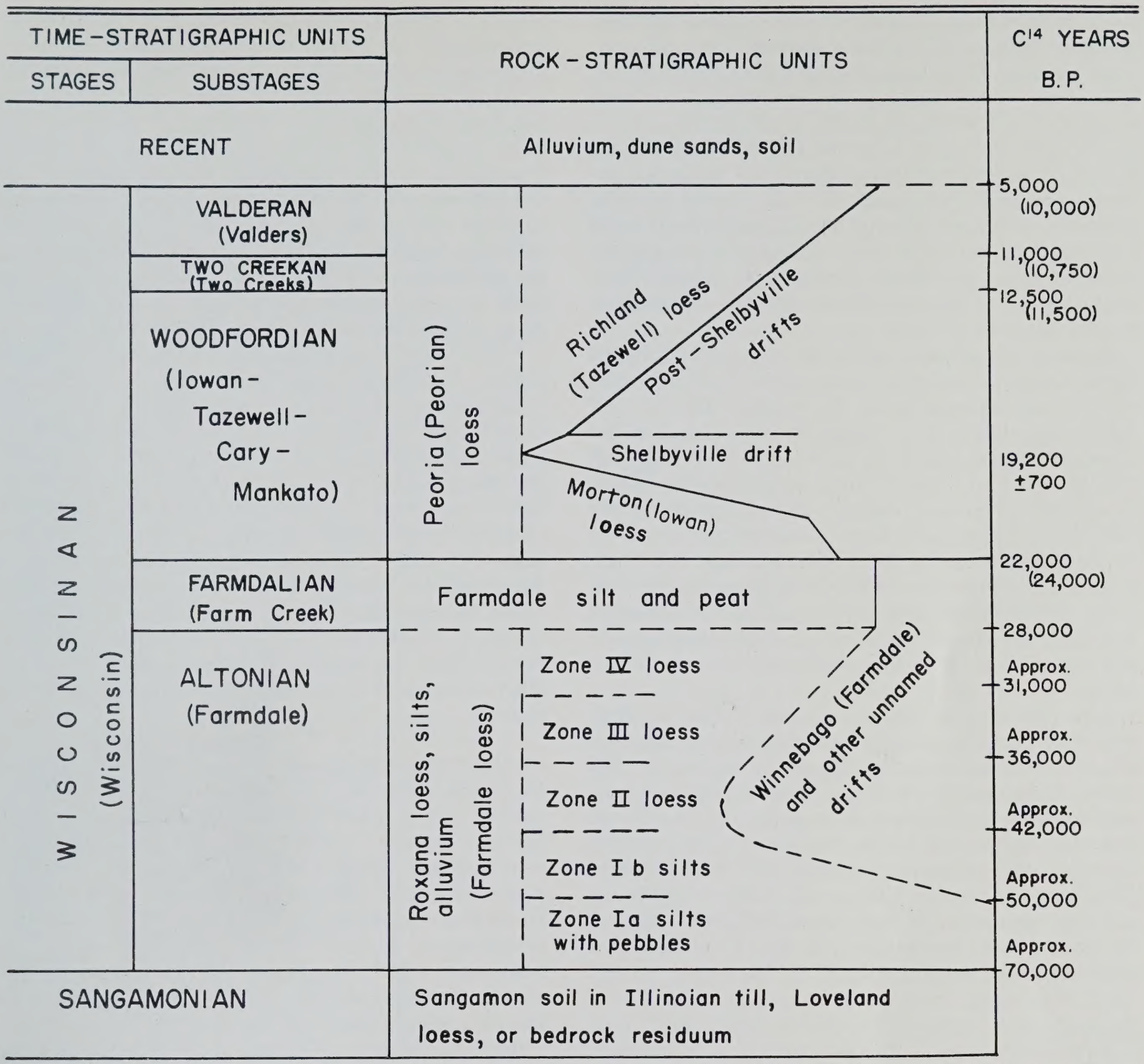
In a general study of loess deposits of Wisconsinan glacial age in Illinois, Frye, Glass, and Willman (1962) reported on the stratigraphy and mineralogy of these deposits and their origin in relation to the drainage history of the state and mineralogy of the glacial tills and water deposited sediments of the major river valleys. These authors describe Peorian loess as a "generally gray to yellow-tan, massive loess . . . relatively coarse, calcareous, and fossiliferous adjacent to the major valleys, and locally contains zones or lenticular masses of eolian sand. Away from the valleys it becomes thinner, finer textured, and is leached." They found evidence suggesting the possibility of an incipient soil somewhat below the present soil surface whose mineral composition "permits the recognition of a main body of loess and a discontinuous upper zone" and thought that this incipient soil might have developed during Twocreekan time (Fig. 3). They determined that the clay fraction of the main body of Peorian loess averaged 70 percent montmorillonite in the Mississippi valley, 54 percent in the Illinois valley, 26 percent in the Wabash valley, and 9 percent in the Ohio valley. They found that the part above the incipient soil averaged 80 percent montmorillonite in the Mississippi valley and only 42 percent in the Illinois valley. They further found that the main body of Peorian loess (including Morton loess) in the Mississippi valley north of the town of Alton averaged 19 percent illite and the upper zone (including Richland loess) averaged 11 percent, and that in all areas studied "the amount of illite is always greater than the sum of kaolinite and chlorite."

In the same study Frye, Glass, and Willman devised a numerical value for further characterizing the two zones of Peorian loess, the organic-rich Farmdale and the Roxana. This value, termed a D.I. ratio, was derived by dividing the X-ray diffraction intensity (counts per second) of the 10 Å spacing for illite by that of the 7.2 Å spacing for kaolinite and chlorite. They suggested that this ratio was "diagnostic for both calcareous and leached samples of loess, but not useful in the B-zones of soils or deeply weathered colluvial zones." For samples of Peorian loess collected in the Mississippi valley above the town of Alton, they calculated an average D.I. ratio of 0.7 for the upper zone and 1.2 for the main body. Selecting data reported by Frye, Glass, and Willman for samples from northwestern Illinois, Leighton (1965) found an average D.I. ratio of 2.3 for the Tazewell portion of Peorian loess (Fig. 3), 1.1 for the Iowan portion, and 0.5 for the Farmdale.

Jones and Beavers (1964b), determining the magnetic susceptibility of a number of the same samples of Frye, Glass, and Willman, found that the two zones in the Peorian loess (the main body and an upper zone) could be easily distinguished. They further found, however, that they were able to consistently distinguish three zones in those sections from the east bluff of Illinois valley as follows: (1) an upper zone with susceptibilities of 10 to 16 x 10^{-6} cgs, (2) a middle zone with susceptibilities greater than 20 x 10^{-6} cgs and, (3) "the lowest zone which is commonly gray" with susceptibilities of 12 to 20 x 10^{-6} cgs. In one section they also noted "a zone of loess at the base of the Peoria with very low susceptibility amounting to 2 to 3 x 10^{-6} cgs," but suggested no interpretation for this lowest zone other than it occurred at the base of the Peorian loess.

Beavers et al. (1963), using $CaO\text{-}ZrO_2$ molar ratios as an index of weathering in a chronosequence of loess soils in southern Illinois, found that "relative weathering between the end members of the sequence as expressed both by calcium-loss data and CaO/ZrO_2 ratios indicates that major loess deposition ended from 11,000 to 11,800 years ago, a date in good agreement with radiocarbon data for withdrawal of glacial ice from northern Illinois." Using the same data, these authors decided that "the ratio of time during to time since loess deposition is about 1:1." They also concluded that "the first one-half to two-thirds of Peorian loess was deposited faster than the surficial portion."

Fehrenbacher et al., in a study of the distribution (1965a), and the composition (1965b) of loess in southeastern Illinois and southwestern Indiana, noted the importance of southwesterly and easterly wind as well as northwesterly winds in loess deposition and the



Diagrammatical sketch showing relationship of Peorian loess to Morton-Richland (Iowan-Tazewell) loesses and other important glacial materials in Illinois, including radiocarbon (C^{14}) dates. (Based on Frye and Willman, 1965, and other sources; terminology and C^{14} years of Leighton shown in parentheses; Leighton considers Two Creeks and Farm Creek as intraglacial intervals.) (Fig. 3)

contribution of relatively small local sources in the area. They also confirmed the findings of Frye, Glass, and Willman that montmorillonite forms a lower proportion of the clay minerals in Peorian loess in the Wabash-Ohio river valleys compared with the Mississippi valley. They further noted that "illite was the dominant clay mineral in Peorian loess of the Ohio and Wabash valleys . . ." and that "a high proportion of the expandable minerals in all samples was vermiculite."

Frye et al. (1968), in a study of the clay mineralogy of Woodfordian loesses in Illinois, found that illite increases from the bottom to the top in three zones in loess sections in the Illinois valley, and that a thin, uppermost, fourth zone high in montmorillonite is present in parts of north central Illinois. In the Mississippi valley in western Illinois, three clay mineral zones are present in the loess. The bottom and top zones are high in montmorillonite and low in illite and the middle zone is intermediate in illite content. The clay mineral zonation of the loesses is related to variations in the sediment source areas brought about by major drainage changes and glacial advances in the area.

Peorian loess in northwestern Illinois. The occurrence of loess in northwestern Illinois was noted by Shaw (1882), Leverett (1899), Trowbridge and Shaw (1916), Leighton (1923, 1931), and by others. As part of soil survey field operations, R. S. Smith and

E. A. Norton began keeping records of loess thickness measurements in 1927. These records have been continued to date by various other members of the Illinois soil survey. Maps showing loess distribution in Illinois were prepared by R. S. Smith et al. (1936), G. D. Smith (1942), and by Leighton and Willman (1950). However, the scale of these maps was too small and the known detail of occurrence too limited to show variations other than general trends, particularly in the northwestern part of the state. More recent loess distribution maps of Illinois prepared by Fehrenbacher et al. (1967), (1968), are also of small scale, but show more detail in some areas.

In the area studied, Peorian loess has been assumed to have been blown by the wind onto the uplands from valley train sources along Mississippi, Illinois, and Rock rivers as well as from the adjacent so-called "Iowan" glacial valley train sediments in Iowa. It was deposited on top of material of Farmdalian (Farm Creek) age or in some places on top of Shelbyville and later drifts except that little or none has been found on till or outwash of Valderan (Mankato) or later age. It is assumed to have been deposited primarily between about 22,000-24,000 and perhaps 13,000-14,000 years B.P. (before present) or approximately between 22,000 and 11,000 years B.C., according to radiocarbon dating.

Although various vertical sections of Peorian loess have been partially characterized, few of these sections are located in northwestern Illinois in the area of this study. More nearly complete characterization of loess sections from this area are in progress. Some of these characterizations will be an attempt to relate physical, chemical, and mineralogical data to detectable field differences, particularly layers of different colors, in the Peorian loess. One of these sections located in Henry County (Profile No. 29, Fig. 1) is described in this bulletin (see page 102).

Soils

Soil survey reports of many counties throughout the Mississippi valley mention loess as a material from which soils have formed. Of the 23 counties or parts of counties occurring in the area studied in northwestern Illinois, Peorian loess is an important soil parent material in all. Reports on the soils of 20 counties have been published by the University of Illinois Agricultural Experiment Station, beginning with La Salle and Knox counties in 1913, and loess is mentioned in each of these reports as one of the soil parent materials.

Smith (1942) made a study of loess and certain soils developed in loess and concluded that (1) "differences in texture of the loess bear, within limits, a linear relation to the logarithm of the distance from the river bluffs," (2) "the rate of the thinning of the loess with the distance from its source is a linear function of the logarithm of the distance," (3) "the carbonate content of the loess decreases as the loess becomes thinner," (4) "the carbonate loss due to leaching during the deposition of the first quarter of the Peorian loess was approximately half as great as the leaching loss in the entire period subsequent to the loess deposition, showing there was a very slow deposition of the loess," and (5) "the differences in the profiles . . . found in loess deposits of varying thicknesses are attributed (1) to the differences in the effective age or relative exposure to weathering of that portion of the loess in which the solum is developed, and (2) to a possible influence of the substratum. . . ." Few of Smith's observations were made in northwestern Illinois and no analyses were made of loess sections or soil profiles in this area.

Muckenhirn et al. (1955), in a study to better characterize the Clinton and Fayette series, two deep loess soils found in abundance in northwestern Illinois, reported that Clinton (1) showed mottles somewhat shallower in the profile than Fayette, (2) had a higher clay maximum in the B2 horizon, (3) had a narrower ratio of coarse silt to fine silt in the B2, (4) had a narrower ratio of exchangeable calcium to exchangeable magnesium in the B2, and (5) was developed in finer-textured loess. A distribution map was included which showed that Clinton was more widespread to the south of the main Fayette area and that in adjacent areas Clinton occurred farther from the loess source. Representative field descriptions of the two soils were given.

In the same study, Muckenhirn et al., described and characterized Seaton, a third deep loess soil that occurs in northwestern Illinois. They reported this soil as having among other characteristics, (1) a silt loam B2 horizon, (2) a wider coarse silt to fine silt ratio compared with Fayette and Clinton, and (3) a slightly wider ratio of exchangeable calcium to exchangeable magnesium, although there was considerable overlap with Fayette. A representative field description of the Seaton soil was included. In addition, the authors concluded that "the Seaton, Fayette, and Clinton series may be considered to represent three degrees of development" of soils formed in loess from a common source, and under comparable native vegetation, slope, and climate.

Beavers et al. (1955) found mostly montmorillonite in some loess soils in Illinois and predominately illite in till-derived soils of northeastern Illinois.

Reimer (1957) compared an upper-slope Tama soil (well oxidized on 1-percent slope) with a lower-slope Tama (moderately well oxidized on 5-percent slope and located approximately 838 feet west of the 1-percent slope). He found the two remarkably similar in porosity, available moisture-holding capacity, pH, and bulk density, but the lower-slope Tama was more strongly mottled, had a slightly lower cation exchange capacity, a lower organic-matter content, and a slightly higher clay content. Reimer concluded that lateral movement of water down-slope and relatively thinner loess on slopes, associated with more effective weathering, accounted for these differences.

Nettleton (1958) determined the distribution of certain forms of nitrogen in several loess-derived soils in Illinois. Profile samples of four of these soils, Seaton, Fayette, Clinton, and Muscatine were collected in northwestern Illinois in Mercer, Henderson, and Warren counties (Fig. 1). Of the three developed under forest vegetation (Seaton, Fayette, and Clinton), Nettleton found that "the milliequivalents of fixed ammonium decrease in amount from the A1 to the A2, increase to a higher amount in the B2, and then decrease to a lower amount in the C." In the soil developed under prairie vegetation (Muscatine) which has no A2 horizon, he found that "the milliequivalents of fixed ammonium increase gradually from the surface down to the B2" and then decrease sharply.

Nettleton further found that "the humic acid-N content of all the soils studied decreased gradually from the surface horizons through the B2 horizon" with a slight increase in the C over the B in most soils, but that "this increase was not found to be statistically significant." Also in comparing a light-colored soil formed under forest vegetation (Fayette) with a dark-colored soil formed under prairie vegetation (Muscatine) in similar stages of development, he found that the dark-colored soil had "greater percentages of humic acid-N in equivalent horizons." He thought that this was probably caused by the higher pH value of the dark-colored soil since the organic residues from grasses are higher in bases than the organic residues of forest litter.

Grossman (1959), in a study of soil aggregate surfaces and interiors, collected profile samples of several till-derived and loess-derived soils. Among these were samples of Seaton, Fayette, Clinton, and Muscatine taken at the same locations as those of Nettleton.

In the developmental sequence, Seaton through Fayette to Clinton, structure formation in the zone of maximum clay accumulation appeared progressively stronger and, Grossman noted, "the number of oriented clay coatings increases markedly from Seaton (minimal) to Fayette (medial)," but that "the size of the oriented clay coatings does not change significantly." He further noted that "movement and accumulation of iron to form concretions, hydrous iron oxide accumulations, and gray void peripheries increase from Seaton to Clinton" as does "the extent of interconnection among voids by veins" and suggested that "this parallels an increase in structural expression in the air-dry state."

Two other features noted by Grossman in respect to orientation of clay coatings in the B horizon of loess-derived soils were that "the loess fabric has well-developed oriented clay coatings that rest abruptly on the elementary fabric" and "the loess fabric has a low degree of preferred orientation." He further observed that "the percentage of accretive surface and the abundance and expression of the oriented clay coatings in the ped (aggregate) interior do not necessarily correspond."

Grossman et al. (1964) further noted that in peds from loess soils, the predominantly accretive ped surfaces have more montmorillonite than bulked peds, but that predominantly degradational ped surfaces have less.

Jones and Beavers (1964a) made a detailed mineralogical study of a profile each of Seaton, Fayette, and Clinton from northwestern Illinois. The Seaton and Fayette samples were collected at the same sites sampled by Nettleton (1958) and Grossman (1959). Samples of the Clinton soil, however, were obtained nine miles south and two miles east of the Clinton sampled by Nettleton and Grossman. The three sampling sites were about one mile, nine miles, and 25 miles, respectively, east-southeast from the Mississippi River bluff and were at the same locations as profile No. 2, 5, and 14 discussed in this bulletin (Fig. 1).

Presenting a small isopach map of Mercer, Henderson, and Warren counties, these authors noted that the Seaton soil formed in loess more than 25 feet thick, Fayette in loess somewhat less than 16 feet thick, and Clinton in loess somewhat less than 10 feet thick. They also noted "that sediment blown by northwesterly winds from valley trains of the Iowa river would particularly influence the character of the loess in this area."

From elemental analyses, heavy-mineral analyses, and magnetic susceptibility data, Jones and Beavers noted that the "upper portions of the sola of Seaton, Fayette, and Clinton soils of northwestern Illinois are developed in recent loess." They also noted that "vertical variability of the parameters measured in Seaton and Fayette soils and relatively uniform analyses for the Clinton soil suggest that grading is important in interpretation of mineralogical characteristics of these loessial soils." They found that "the upper portions of the sola are low in calcium and iron content in the 5 to 20 μ and 20 to 50 μ fractions" and suggested that this was probably caused by leaching loss, but did not rule out the possibility of "a reflection of deposition of a recent loess blanket poor in these elements." Their data show that average CaO content of the fine silt fraction of the A2, B1, B2, and C1 of Seaton is highest of the three soils and that of Clinton is lowest, indicating greater weathering in Clinton as compared with Fayette and greater weathering in Fayette as compared with Seaton. CaO content of the coarse silt fraction tends to show the same trend, except that no data were obtained for the A2 of Clinton and the data of the B2 of Fayette and Seaton averaged approximately the same.

Fehrenbacher, Ray, and Edwards (1965c) studied soil properties and root penetration in thin loess over shale soils in northwestern Illinois, and noted that the loess portions of these soils were similar physically to those of thick loess soils in the area. The shale was very impermeable and prevented effective root penetration of corn, but was less restrictive to alfalfa root penetration.

Jones and Beavers (1966) in studying the weathering in surface horizons of Illinois soils by using molar ratios of CaO, K_2O, Fe_2O_3, and ZrO_2 concluded that the least developed soils occur in the thick loess deposits of extreme northwestern Illinois.

Jones, Ray, Fehrenbacher, and Beavers (1967) in a study of the mineralogical and chemical properties of the same soils of Fehrenbacher et al. (1965c) found that weathering of silt-size minerals in the loess portion of these soils has been slight. Iron was the most sensitive indicator of weathering. Clay mineral weathering has resulted in the formation of chloritized vermiculite and montmorillonite from illite. Most of the montmorillonite, however, is inherited from the parent loess. In general, mineralogical and chemical weathering of the loess portion of these soils were similar to that in nearby thick loess soils.

Climate

Climatic agencies, particularly temperature and rainfall, are responsible for many of the changes that earth materials undergo in the formation of soils. Those profile characteristics that distinguish the soils of northwestern Illinois from other regions (e.g., arid, semiarid, tropical, and so on) are primarily the result of the climate that has prevailed throughout the period of soil development.

Early postglacial climate. Major fluctuations in temperature between glacial and interglacial periods are self-evident. Proof that fluctuations have occurred since the last major glaciation or within about the last 15,000 years is based on a number of lines of evidence. A few of the better known are: successions of plant remains in peat bogs, accompanied by a recurrence of identifiable former surface layers; analyses of preserved pollen; the range of marine and terrestrial fossils beyond the known occurrence of present-day specimens; occurrence of shorelines of former lakes; trends in temperature of sea surface water; and studies of varves, tree rings, perennially frozen ground, and regional snowlines. Some of these demonstrate a sequence of climatic changes involving moisture as well as temperature.

Deevey (1953), quoting from various sources, indicated that a warming trend began about 7,000 or 8,000 B.C. and lasted until about 600 B.C., with a thermal high between about 5,000 B.C. and 3,000 B.C. This latter period has been termed a **climatic optimum** by the Scandinavians.

Deevey and Flint (1957) continued to recognize a relatively warm interval extending from about 7,000 B.C. to about 600 B.C. and applied to it the term **hypsithermal.** They further noted "recurrence horizons of bogs and their climatic implication" indicated "that several oscillations of atmospheric moisture were superposed on the postglacial thermal variation" which tended to confuse the "fact that parts of the hypsithermal interval were warmer than others." These authors were led to infer that in some parts of Europe the thermal maximum of this period was 2° to 3° C. (3.6° to 5.4° F.) higher than at present.

Willett (1953) suggested that "there is continually in progress an entire spectrum of cyclical fluctuations of climate, cycles of shorter period and smaller amplitude being superposed on those of longer period and larger amplitude." He noted that "the major climatic cycles of postglacial time apparently have occurred in phase on the two hemispheres," i.e., Europe and North America. He further noted that "from 4,000 to 2,000 B.C. most glaciers disappeared, at least in Europe, and even the Greenland and Antarctic ice caps decreased several hundred feet in thickness."

Late postglacial or early historical climate. Russell (1941) found from documentary evidence that numerous climatic changes have occurred since about 2,000 B.C. and that glacial activity was part of this climatic record. Matthes (1939) introduced the term **Little Ice Age** for a period of renewed glacier formation and activity and suggested the beginning of this period as about 2,000 B.C. Only mountain glaciers were formed and although no definite time limits were suggested, Matthes thought that this period may be continuing at the present time. According to Russell (1941), several short advances and retreats of mountain glaciers occurred, but he then concluded that the last glacial recession appeared to be worldwide and suggested that the century from approximately 1840 to 1940 had higher average temperatures than the century just preceding.

Recorded climatological data (1894 through 1965). Although some evidence indicates a number of possible climatic changes since recession of the last continental glacier, no change appears to have been extreme or long lasting and the overall climate probably was somewhat similar to that of today. Therefore, a brief resume of recorded rainfall and temperature is given in order that their effects on soil development in this region may be compared with those of other climatic regions.

Short-period fluctuations of temperature and rainfall in northwestern Illinois are well known. Daily recordings have been kept at a number of stations for more than 50 years. During this time, temperatures have been shown to vary considerably from day to day and to have varied more than 100° F. from the extreme lows of winter to the extreme highs of summer. Rainfall has also been shown to vary and total yearly precipitation has, at times, varied more than 20 inches of water between two consecutive years.

Of the 30 or more weather stations in operation at one time or another in the area studied, precipitation and temperature data from four were examined in detail. These four stations were chosen to represent the four general sections of the study-area for which more than 50 years of recorded data were available. The Freeport station, established in 1909, represents the north, Walnut station, established in 1892, represents the central part; Monmouth station, established in 1894, represents the southwest, and Bloomington-

Normal station, established in 1892, represents the extreme southeastern part (Fig. 1).[1]

Long-time trends were calculated[2] for annual precipitation[3] and for average mean yearly, mean January, and mean July temperatures[4] for the period 1894 to 1965, inclusive, except Freeport where the trend is for 1909 through 1965. From these calculations and other comparisons of the data, the following information and general trends are indicated.

Precipitation tended to increase somewhat during the period of recorded data at all four weather stations. The calculated increase was 0.25 inch at Bloomington-Normal, 0.76 inch at Freeport, 1.05 inches at Walnut, and 2.76 inches at Monmouth (Table 2).

Comparing the data by six-year periods shows that precipitation averaged highest during the period 1924-1929, inclusive, at all four stations. Further comparisons show that the six-year period 1912-1917, inclusive, had the lowest average rainfall at Walnut, Monmouth, and Bloomington-Normal, whereas the three-year period 1909-1911, inclusive, was lowest at Freeport. At Walnut, Monmouth, and Bloomington-Normal stations average rainfall during the period 1960-1965, inclusive, was higher than the long-time average and the period 1954-1959 was lower than the long-time average. No significant difference is apparent at Freeport between these two periods and the long-time average. In general, the most southerly station, Bloomington-Normal, averaged highest in total yearly rainfall and the most northerly station, Freeport, averaged lowest although neither was consistently highest nor lowest, respectively, during all six-year periods.

Yearly fluctuations and the calculated long-time rainfall trend at the Walnut station are shown in Figure 4. Data from Freeport, Monmouth, and Bloomington-Normal show similar trends.

Temperature has varied somewhat throughout the period of recorded data. Short-term variations (5-10 years) seem to be indicated, but with no marked regularity. Longer term (72 years — Table 3) data ap-

Table 2. — Average Annual Precipitation in Inches of Water by Six-Year Periods, 1894-1965, and Calculated Long-Time Increases at Freeport, Walnut, Monmouth, and Bloomington-Normal Weather Stations

Years	North (Freeport)	Central (Walnut)	Southwest (Monmouth)	Southeast (Bloomington-Normal)
		Inches		
1894–1899...	....	31.4	31.8	36.4
1900–1905...	....	35.6	34.6	36.6
1906–1911...	32.7[a]	35.4	37.9	36.3
1912–1917...	33.0	30.7	31.1	33.6
1918–1923...	33.8	32.4	32.9	37.9
1924–1929...	35.4	36.9	39.8	41.4
1930–1935...	30.9	33.6	35.9	34.1
1936–1941...	34.3	35.1	34.8	35.6
1942–1947...	34.9	33.6	37.9	38.8
1948–1953...	34.4	34.2	32.6	36.2
1954–1959...	33.7	32.3	34.3	33.6
1960–1965...	33.4	35.1	37.4	37.9
Average.....	33.6	33.8	35.1	36.5
Long-time increases[b]	+0.76	+1.05	+2.76	+0.25

[a] Average precipitation at Freeport for this period is for three years only, 1909-1911.
[b] Calculations courtesy Agronomy Statistical Laboratory.

Table 3. — Average Mean Annual, Mean January, and Mean July Temperatures in Degrees Fahrenheit by Six-Year Periods, 1894-1965, and Calculated Long-Time Increases (+) or Decreases (—) at Freeport, Walnut, Monmouth, and Bloomington-Normal Weather Stations

Years	North (Freeport)			Central (Walnut)			Southwest (Monmouth)			Southeast (Bloomington-Normal)		
	Annual	Jan.	July	Annual	Jan.	July	Annual	Jan.	July	Annual	Jan.	July
							Degrees F.					
1894–1899..................	...	...	...	50.4	23.6	75.7	50.7	23.9	74.3	51.8	25.1	75.7
1900–1905..................	...	...	...	50.1	23.3	75.1	49.5	22.5	74.7	51.7	25.5	76.8
1906–1911..................	47.7[a]	20.6[a]	73.1[a]	51.2	26.4	75.4	51.8	26.6	75.5	52.7	29.6	75.7
1912–1917..................	46.8	18.4	73.6	49.6	22.0	76.3	50.7	23.6	76.9	51.6	26.0	77.4
1918–1923..................	48.8	20.6	74.2	51.6	22.5	76.1	52.4	24.3	76.3	53.0	25.4	76.7
1924–1929..................	47.1	18.4	72.0	49.6	21.5	74.2	50.5	22.7	74.8	51.5	24.3	74.9
1930–1935..................	49.5	25.1	75.6	52.2	28.2	78.7	52.6	28.8	78.2	53.4	30.9	79.0
1936–1941..................	48.8	19.5	75.3	51.6	22.8	77.7	52.2	22.5	77.7	52.8	24.3	77.9
1942–1947..................	48.2	21.8	72.0	51.1	25.6	75.4	51.3	26.0	74.6	52.4	27.8	75.3
1948–1953..................	47.9	20.0	72.8	51.1	24.8	76.2	51.0	25.4	74.7	53.1	29.2	76.4
1954–1959..................	48.2	18.6	72.5	51.4	22.2	76.7	51.9	23.0	76.2	53.5	25.8	77.0
1960–1965..................	48.2	18.4	71.7	50.3	20.7	73.5	51.6	22.8	74.1	52.5	24.8	75.0
Average....................	48.1	20.2	73.3	50.8	23.6	75.9	51.3	24.3	75.7	52.5	26.6	76.5
Long-time increase (+) or decrease (—)[b]............	+.78	−.26	−1.85	+.95	−.99	−.08	+1.24	+.04	+.01	+1.31	+.56	−.23

[a] Average temperatures at Freeport for this period are for three years only, 1909-1911.
[b] Calculations courtesy of Agronomy Statistical Laboratory.

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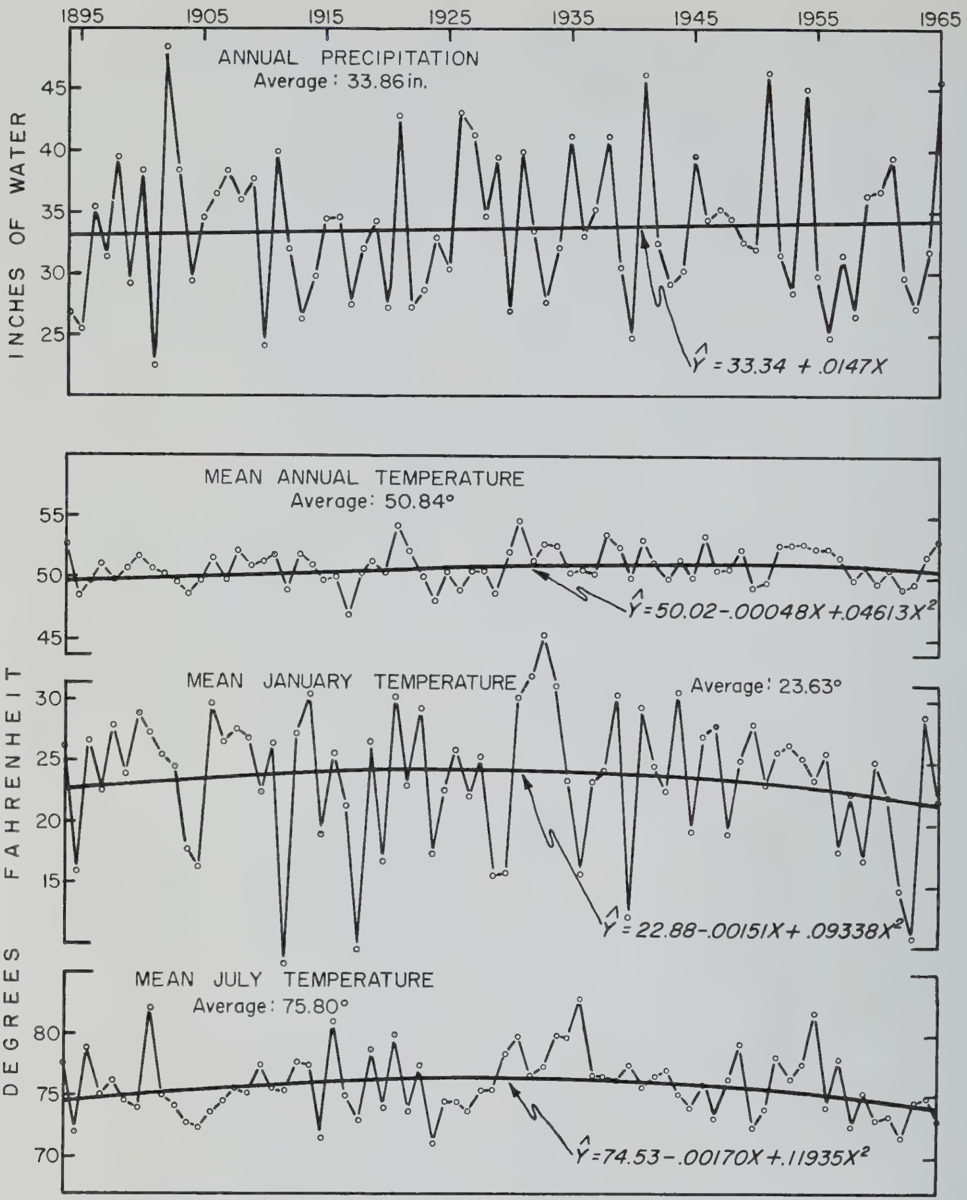
[1] Temperature and precipitation data courtesy of Illinois State Water Survey and U.S. Weather Bureau.

[2] Trend calculations were determined by personnel in the Agronomy Statistical Laboratory under the direction of R. D. Seif.

[3] Precipitation includes all rainfall and melted snowfall reported in inches of water.

[4] Mean daily temperature is the average of the highest and lowest recorded temperatures in each 24-hour day. Mean monthly temperature is the average of the mean daily temperatures for the month. Mean yearly or annual temperature is the average of the mean monthly temperatures for the year.



Fluctuations and long-time trends in precipitation and Annual, January, and July temperatures at Walnut weather station for the 72-year period 1894-1965, inclusive. In each equation, X = the numbers representing the years after 1894 which is taken as zero.
(Fig. 4)

pear to show consistent mean annual increases, but mean January and mean July temperatures show both increases and decreases among the four stations (Table 3).

Calculated long-time (1894-1965, inclusive) mean annual average temperature increase was less than 1° F. at Freeport and Walnut and about 1¼° F. at Monmouth and Bloomington-Normal. Average mean January temperature increased only at Monmouth and Bloomington-Normal, decreasing at Freeport and Walnut. The average mean July temperature increased only at Monmouth (0.01° F.) while showing decreases at Freeport, Walnut, and Bloomington-Normal.

Comparing data by six-year periods (Table 3) shows that all mean January and mean July temperatures averaged highest during 1930-1935, inclusive, at the four stations. Mean annual temperature averaged highest during the same six-year period at Freeport, Walnut, and Monmouth while remaining only 0.1° F. below the six-year (1954 through 1959) average high at Bloomington-Normal.

Data in Table 3 also show mean annual, mean January, and mean July temperatures all averaged relatively low during 1960-1965, compared with the other six-year periods. Though **annual** mean temperature does not show the lowest average during this period (1960-1965) at any station, the **January** mean does average lowest at Freeport and Walnut and the **July** mean averages lowest at Freeport, Walnut, and Monmouth and second lowest at Bloomington-Normal.

Yearly fluctuations and calculated long-time temperature trends at the Walnut station are shown in Figure 4. These indicate that, although mean annual temperatures were slightly higher during the last part of the period (1960-1965, inclusive) compared with the first part (1894-1900, inclusive), the trend was upward until only about the 1940-1950 decade and has been slightly downward since that time. Also, mean January and mean July temperatures both show definite downward trends following about the 1930-1940 decade. Data from Freeport and Monmouth weather stations indicate the same trends as shown for Walnut. Although the trends at Bloomington-Normal are also downward for mean January and mean July temperatures since about 1945, mean annual temperature has only tended to level off and does not yet show a downward trend at this station.

The present general downward trend in temperature, as shown from data recorded at the Freeport, Walnut, and Monmouth stations, may also be worldwide as noted by Mitchell (1961), who found that since about 1940 temperature data "show that the great warming trend of the earlier part of our century has not only leveled off, but has apparently reversed to a substantial degree."

In general, cool temperatures tend to accompany wet periods and warm temperatures tend to accompany dry periods. Comparing precipitation data in Table 2 with temperature data in Table 3, the period 1960 through 1965 may be considered cool and wet in northwestern Illinois. Although calculated **mean annual** trends for the 72-year period, 1894-1965, inclusive, indicate a possible temperature increase of about 1.0° F. throughout the period of recorded data, the calculated long-time trends for **January** and **July,** with an average decrease of about 0.7° F. not only do not bear out the indicated annual increase, but show a definite decline since about 1940-1950. Temperature data in Figure 4 also demonstrate this decline.

Area of Study and Methods Used

Previous studies have shown some variability in soils developed in moderately thick to thick loess in the Mississippi valley. Most of these studies were limited in scope; none characterized all of the important loess-derived soils in a given area; and few were in sufficient detail to relate laboratory data to field knowledge for sound modern soil correlation and classification purposes.

Loess has generally been considered a uniform earth material. Though Leverett (1899) reported that loess was coarser textured and more porous on the river bluffs near the source than at some distance from the bluffs, the relationship of thickness and texture of the loess and distance from source to soil development was not well recognized until the work of Smith (1942). Since that time, soil survey investigations in Illinois and elsewhere have clearly demonstrated these relationships. They are particularly well demonstrated in certain parts of northwestern Illinois.

The area studied covers that part of Illinois lying north of the south line of Henderson, Warren, Peoria, Tazewell, and McLean counties and west of the east line of Woodford, Lee, Ogle, and Winnebago counties (Fig. 1). A soil survey had previously been made in all of the 23 counties or parts of counties included in this study. Maps and reports of 19 of these counties were published before the introduction of modern concepts of soil science into soil survey field and laboratory procedures. The original field maps of the four remaining counties were never published. Three of these latter four counties, i.e., Carroll, Henderson, and Stephenson, were resurveyed in detail and Henderson has been published as Soil Report No. 77. A recent reconnaissance survey was made of Jo Daviess County and has been published as Circular 927. In addition one of the 19 previously published counties (La Salle) has been resurveyed in detail.

Maps of all of the counties, whether published or unpublished, were useful in designating areas of light-colored and dark-colored soils, silt loam and sandy loam to sand soils, soils with sand, gravel, or bedrock at a depth of less than 30 inches, and areas of stream alluvium. Those county maps in which the field mapping was completed before 1933 did not indicate soil separations based on oxidation or internal drainage characteristics or on kind of material (i.e., till, loess, or outwash), particularly if the till and outwash materials were silty, nor did they indicate separations based on contrasting material below a depth of 30-36 inches which influenced soil development. Maps prepared between 1934 and 1945 did not show separations based on differences in stage of development in the loessial soils as indicated by B-horizon texture and structure.

Field Methods

Reconnaissance field studies were made in all counties included in the study except Henderson, which had a recent detailed soil survey map, and Carroll, Stephenson, and La Salle in which detailed progressive surveys have been recently completed. Examinations were made of road cuts, gully banks, excavations of various kinds, or with a soil auger in fields or along roadsides wherever suitable sites could be conveniently located. Observations were made at frequent but irregular intervals to discover and record the following: (1) development of soil profile and identification of soil series and soil type when possible, (2) presence of Peorian loess and its thickness wherever it could be identified and measured, (3) depth to free carbonates as determined by effervescence with hydrochloric acid, (4) kind and character of material beneath the Peorian loess, particularly where loess was less than five feet thick, as well as character of material where no loess was present, and (5) approximate slope at observation site.

Location of each observation was recorded by county name, surveyor's township number, range number, and section number along with quarter section, 40, and 10 acres, and as much of the above listed information was recorded as could be noted. Use was made of U.S. Geological Survey topographic maps, county highway maps, and published soil survey maps. From these field observations and maps, the map on page 13 showing the depth of Peorian loess and the "Soil Association Map of Northwestern Illinois" were constructed. A copy of the soil association map in color is attached inside the back cover of this bulletin.

Numerous examinations were made in the area of known occurrence of each of the soils to be sampled. From these observations, the sampling site was chosen at the spot thought to best represent the particular soil. Horizon samples of the 15 soil series were collected from 36 locations as indicated in Figure 1.

Prior to 1964, a pit was dug at each site and the freshly exposed vertical soil section or profile was carefully examined, divided into horizons, and described. All horizon characteristics of each profile were recorded. Other features noted were: slope gradient and direction, vegetative cover, and, if possible, thickness of loess and kind of material beneath the loess (see Appendix). The exact location in relation to a relatively permanent point was also recorded. Bulk samples were then taken from one side of the pit and placed in labeled bags for transfer to the laboratory. During 1964, 1965, and 1966, a power probe was used to remove a continuous, undisturbed, 3-inch core of soil and underlying loessial material. This method was helpful in reducing time and effort required to obtain soil descriptions and samples and also facilitated taking samples from much greater depths than could be taken in a hand-dug pit.

Most samples were of the full thickness of a horizon or layer as described (see Appendix), except that some horizons 10 to 12 or more inches thick were subdivided. Thick sections of underlying loessial material, where sampled, were subdivided into sampling layers 4 to 7 inches thick. In addition to the bulk samples, four to six undisturbed core samples were taken from major horizons at most of the sites where a pit was dug. These were 3- by 3-inch cores taken with a sampler such as used by Uhland (1949).

Laboratory Methods

The bulk samples were air-dried in the laboratory, crushed with a wooden roller on a hardwood board, and put through a 2 mm. round-holed sieve. No material greater than 2 mm. in diameter is reported for any samples, as normally there was none present or it consisted of very minor amounts of concretionary material or, in the case of surface horizons, undecomposed roots or other plant residues. The soil material passing through the sieve was placed in glass jars with screw-on type lids and was stored until needed for the various physical, chemical, and mineralogical analyses.

Core samples were obtained from selected horizons of several profiles. When these samples were received in the laboratory, the undisturbed cores were weighed to determine moisture content at time of sampling and then saturated with water prior to determining hydraulic conductivity and capillary and noncapillary porosity.

Particle-size distribution (mechanical analysis) was determined on most samples (profiles sampled after 1954) by slight modifications of the procedure described by Kilmer and Alexander (1949). A few samples obtained prior to 1954 were analyzed by the method outlined by Gieseking (1949).

Bulk density and capillary and noncapillary porosity were determined on 3-inch cores by the methods described by Uhland (1949). The method of Uhland and O'Neal (1951), employing a constant-head conductivity rack, was used to determine hydraulic conductivity on these same cores.

The techniques used for determining ⅓-atmosphere and 15-atmosphere moisture percentages are described by Richards et al. (1954). The difference in soil-moisture content between field capacity (approximately ⅓-atmosphere percentage) and the wilting coefficient (approximately 15-atmosphere percentage) is referred to as water retention values or the available moisture range and represents moisture considered available for plant growth.

Cation exchange capacity was determined on most samples by the method of Peech et al. (1947) involving direct distillation of adsorbed ammonia and on some samples by modification of the method outlined by Bray (1942). In both procedures the ammonia was distilled into boric acid solution rather than the standard acids as outlined in the original methods. Exchangeable K, Na, and Ca for about one-half the samples were analyzed from neutral normal ammonium acetate leachate with a Beckman (Model DU) spectrophotometer with flame attachment using an oxygen-hydrogen flame.

A Coleman (Model 21) flame photometer with attached Model 6C Junior spectrophotometer using a natural gas-oxygen flame was used in determining exchangeable K on 16 profiles and exchangeable Na on eight of the profiles studied. Na was estimated on eight profiles (No. 4, 8, 12, 16, 17, 21, 25, and 26). Exchangeable Ca and Mg were determined on the above samples by slight modification of the method of Barrows and Simpson (1962). When exchangeable K, Na, and Ca were determined with the Beckman (Model DU) spectrophotometer or sodium was estimated, total exchangeable Mg was calculated as the difference between the total base content obtained and the sum of exchangeable Ca, K, and Na. For profiles 1, 3, 6, 7, 9, 11, 30, and 31 exchangeable Ca was determined as calcium oxalate and exchangeable Mg as magnesium ammonium phosphate as outlined by Peech et al. (1947). Analyses from these various methods of determining individual cations are considered to be comparable.

pH was determined with a glass electrode using a 1:1 soil-water ratio.

Most of the organic carbon determinations were made using slight modifications of the wet-combustion methods of Allison (1935) or Walkley and Black (1934). For profiles 1 and 3, organic matter was determined by loss of weight with H_2O_2 treatment. These values were divided by 1.72 and reported as percent organic carbon.

Carbonates in selected calcareous horizons were analyzed by gravimetric loss of carbon dioxide as described by Richards et al. (1954). For profiles 9, 11, and 31, carbonates were determined manometrically by the method of Williams (1948).

Available potassium and the adsorbed (P_1) and adsorbed plus acid-soluble (P_2) phosphorus were determined by Bray's methods as described by Laverty (1963).

The clay ($<2\mu$) fractions were obtained by centrifugation of H_2O_2 treated and calgon dispersed samples. Cation exchange capacity of the clay was determined by NH_4 distillation similar to CEC of total soil. Total K in the clay was determined by X-ray fluorescence on pressed samples, Beavers (1960), using chemically analyzed clay samples from Illinois soils as standards. A Norelco X-ray unit with a copper target and operated at 35 Kv. and 15 ma. was used for diffraction analysis. Clays were K and Mg saturated and freed of excess salts with ceramic filters. All clays were solvated with ethylene glycol. A few samples were heated to 550° C. for 30 minutes. Estimation of amounts of various clay minerals was based on peak heights (counts per second), potassium content, and amount of collapsing following K saturation.

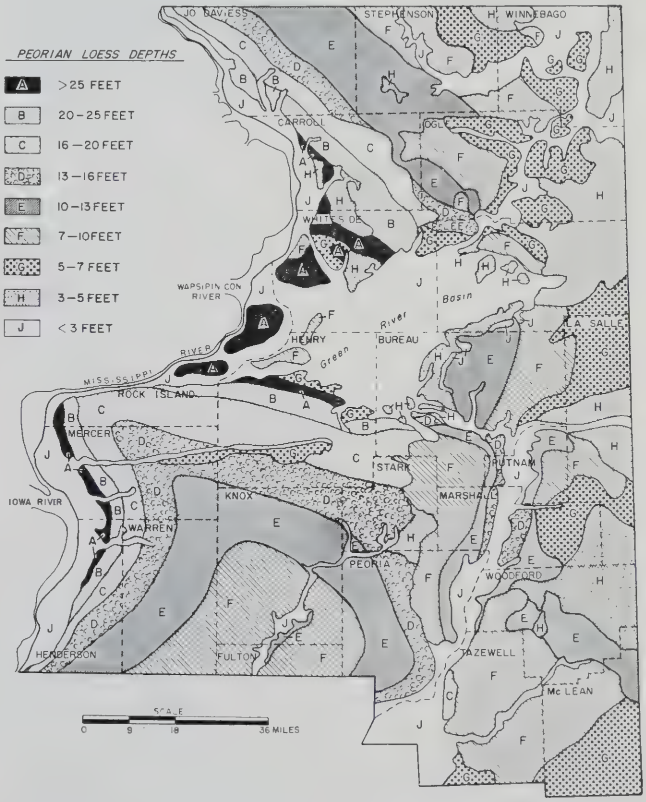
Source, Distribution, and Age of Peorian Loess in Northwestern Illinois

Loess thickness measurements were made at more than 2,000 sites in the area studied by many present and former members of the Illinois soil survey. At most sites, depth of total loess was recorded and attempts were made to interpret thickness of Peorian and Farmdale (Roxana) loesses and to identify the underlying material. Most observations were made with a soil auger on slopes less than about 3 or 4 percent, except that in areas where total loess was greater than 10 feet thick, use was also made of road cuts or other convenient excavations. From these observations and measurements, Fig. 5 was constructed.

Peorian loess more than 5 feet thick is the parent material of soils covering slightly more than 7,000 square miles or about 57 percent of the area studied. An additional 3,000 square miles have between 1 and 5 feet of loess and the remaining (about 2,300 square miles) have little or no loess as part of the soil parent material.

Loess in northwestern Illinois was wind-deposited. No other depositing agency could distribute as much relatively uniform silt-size material over such a widespread area. According to the loess-depth lines in Figure 5, the loess-depositing winds came primarily from the west-northwest, although some blew from other directions, particularly the southwest and probably also the east and northeast.

The loess-depth lines indicate that the main body of Peorian loess in this region was derived from three principal sources: (1) Mississippi River glacial floodplain from Jo Daviess County to just beyond Rock Island in central Rock Island County, probably including also the glacial valley train of Wapsipinicon River in Iowa, (2) Mississippi River glacial floodplain from western Rock Island County to southern Henderson County, and including the lower Iowa-Cedar glacial floodplains in Iowa, and (3) Illinois River glacial floodplain from Putnam County to southern Tazewell County. Two other probable source areas as indicated



Major areas in northwestern Illinois covered by Peorian loess varying from greater than 25 feet thick to less than 3 feet thick as measured on slopes ranging primarily between 1 and 4 percent. (Fig. 5) by some of the loess-depth lines were part or all of Green River basin and part of Rock River valley. Just how Rock River, including Pecatonica and possibly other tributaries, influenced Peorian loess deposition before becoming established in its present channel is unknown. Interferences of surficial material deposited along parts of Rock River valley and in parts of Green River basin subsequent to the retreat of the Shelbyville glacier is indicated. Slight evidence was found that smaller stream valleys in northwestern Illinois, with floodplains up to one or two miles wide, were sources of loess. Some fine sand blown on to the uplands from these smaller streams is present east of Rock River in Winnebago County, south of Edwards River in Mercer and Henry counties, and east of Spoon River in Knox County, and a few isolated measurements indicate possible thickening of loess, particularly near Pecatonica River in northwestern Winnebago County and east of Spoon River in southern Knox County, but no other consistent displacement of loess-depth lines was noted. The possibility of a local source of loess from the Pecatonica or Rock rivers in Winnebago and Ogle counties is also indicated by carbonate content data (see page 17).

In Iowa, on the other hand, glacial valley-train materials along Wapsipinicon, Cedar, Iowa, Des Moines, and possibly other streams, were sources of Peorian loess. These streams carried sediments from which fine sands and silts were blown into some parts of western and northwestern Illinois. They originate in that part of northern Iowa covered with till from a Wisconsinan glacier whose melt waters drained down them into the Mississippi River.

Peorian loess decreases in thickness with distance from source in a relatively regular manner where the underlying material is a nearly level plain and is of Farmdale (Farm Creek) age or older. Where till or water-deposited sediments of Woodfordian (Iowan-Tazewell-Cary) age occur, thickness of Peorian loess is related to both distance from source and time of deposition of the underlying deposits.

In Areas A, Figure 5, Peorian loess is 25 feet or more thick. These areas are all near the Mississippi River where glacial sediments as sources of loess were available presumably throughout Peorian loess depositing time. Furthermore, the A areas are located only in those places that received some of the most recent and coarsest silty loess. And it is in these areas where the weakly developed soils occur (see Port Byron-Seaton soil areas on colored soil association map). It is also in these areas that much wind-blown fine sand occurs, some as sandy strata interbedded with silty loess and some as cores of loess drifts or pahas.

Very little if any coarse-textured, recent loess is found along the Illinois River. Either no waters carrying such sediments came down the Illinois from the northeast or across Green River basin from the northwest or the flow of water was too slow or too rapid to deposit the required sediments. Glass et al. (1964) redocumented earlier conclusions that the ancient Mississippi River was diverted from its former Illinois River channel in early Woodfordian (Tazewell) time by the Shelbyville glacier, thus eliminating the flow of sediment-laden glacial waters from the northwest. No evidence was found to indicate that a comparable coarse silt came from the northeast following retreat of the Shelbyville and later glaciers. Therefore, it seems apparent that either the loess along the Illinois River was deposited earlier than the latest along the Mississippi River or the Illinois River loess was all considerably finer textured.

Maximum thickness of Peorian loess in the area studied was not determined. A measurement of 57 feet was made in a paha in northern Rock Island County without reaching the base of the Peorian loess. The observation was 1½ miles in a south to southeast direction from the bluff and about six to seven miles southeast of the present junction of Wapsipinicon River with the Mississippi. Several other measurements of more than 25 feet of loess were made in northern and central Rock Island County without reaching identifiable Farmdale (Roxana) loess or other underlying material. Also a measurement of 45 feet of relatively coarse Peorian loess was made in western Mercer County nearly opposite the junction of the Iowa River with the Mississippi.

A measurement of 17 feet was made in Tazewell County which appears to be about maximum thickness of Peorian loess along the Illinois River valley in the study area. Several additional measurements of 15 and 16 feet were made in other places along the Illinois.

Within the areas of Wisconsinan-age till and outwash materials the thickness of Peorian loess often varies independently of distance from source due to advances and retreats of various Woodfordian (Iowan-Tazewell) glaciers. Either some of these moved into parts of northwestern Illinois during the time of Peorian loess deposition and either removed the previously deposited loess or covered it with additional till or outwash or erosion may have removed some of the earlier deposited loess. Thus, relatively thin loess occurs in places where thick loess would be expected and in some places thick loess and thin loess areas occur side by side. This may be noted particularly in parts of Carroll and Whiteside counties (Ray and Watters, 1961), as well as in Lee, Bureau, and Woodford counties.

As indicated in Figure 3, Farmdale silt and peat underlie Peorian loess. In general this is true outside the area covered by Shelbyville or later drifts.

Many radiocarbon (C^{14}) dates have been obtained on the peaty Farmdalian-age material collected from various places by various investigators. Nearly all show C^{14} dates between 28,000 to 29,000 and 22,000 to 24,000 years B.P. (before present). Two such dates of peat material collected for this study from beneath 11 feet of Peorian loess in southern Peoria County (Fig. 1) showed C^{14} dates of 24,100 ± 600 years

B.P. (I1963) from a composite sample of organic debris from the upper 20 inches of Farmdale material and 26,100 ± 900 years B.P. (I1964) from near the middle part. More peat and silts lay beneath the latter sample and they in turn were underlain by a Sangamon paleosol in Illinoian drift. This suggests with some certainty that Peorian loess-depositing time began about 23,000 to 24,000 radiocarbon years ago or shortly thereafter.

Frye and Willman (1960) presented two C^{14} dates from material collected from Morton (Iowan) loess of 20,340 ± 750 years B.P. (W 349) and 20,700 ± 650 years B.P. (W 399). They also presented C^{14} dates of 19,200 ± 700 years B.P. for material taken from Shelbyville till (W 187), 17,100 ± 300 years from Peorian loess (W 370), and quoted an average date of 11,400 years B.P. for Two Creeks forest bed material. According to these authors the time of Peorian loess deposition thus extended from about 21,000 to 22,000 to about 11,000 radiocarbon years ago.

Leonard and Frye (1960) in a study of molluscan fauna from Peorian loess estimated that the age of the shells ranged from approximately 22,000 to 15,000 C^{14} years ago.

For purposes of the present study two C^{14} dates were obtained from snail shells imbedded in different parts of the Peorian loess section. One date of 16,000 ± 340 years B.P. (I1719) was determined from shell material collected at a depth of eight to nine feet in a 12-foot Peorian loess section. This sample was taken in west-central Warren County about eight and one-half miles east-southeast from the Mississippi River bluff (Fig. 1). The second date of 13,700 ± 260 years B.P. (I1720) was determined on shell material collected at a depth of four to five feet at the Mississippi River bluff in northern Henderson County. No total Peorian loess thickness could be determined at this latter site because a layer of fine sand occurred at a depth of 90 to 100 inches as well as a thick strata of fine sand extending from a depth of 12 feet to more than 31 feet. The relationship of thickness of wind-blown sand to thickness of silty loess has not been determined.

Checking on the validity of radiocarbon dates from snail shells, Rubin, Likins, and Berry (1963) concluded that "uncertainties in radiocarbon dates from snail shells can be of the order of one thousand years or somewhat more, depending on the food sources, and are of the same range as the analytical error in older age samples." If these food sources included finely divided calcium carbonate particles that may have settled on the vegetation as a component of loess and from which radioactive carbon had been exhausted, the snail shell dates are more apt to be 1,000 years too old rather than too recent. This would indicate a possible C^{14} date of approximately 15,000 years B.P. for the Warren County (I1719) date and 12,700 years B.P. for the Henderson County (I1720) date. Thus, the few feet of loess above the snail shells in Henderson County could have been deposited just prior to the Two-Creekan interval (Fig. 6) or perhaps at about the same time.

A section of coarse silty Richland (upper Peorian) loess. Snail shells and fragments were collected for C^{14} sample I1720 in the zone at base of spade. (Fig. 6)

Antevs (1955, 1957) appraised radiocarbon datings of late Pleistocene events and decided that most C^{14} dates are underestimates of the actual number of years. He believed that "an informed geological estimate is better than a C^{14} date lacking geological support." He concluded that the radiocarbon date for the Two Creeks interval must be 8,000 or more years too recent and that the interval more likely occurred about 19,500 years ago.

Li (1943) studied a soil developed in two Indian mounds constructed of calcareous Peorian loess. The mounds were located on the Illinois River bluff in Fulton County about 10 miles southwest of Peoria County. At that time, archaeologists had estimated the age of the mounds as about 1,800 years, but more recent estimates (Bluhm, 1959) place the building of the mounds at between 300 and 1300 A.D. or their age at perhaps one-half that furnished to Li. The material used to build the mounds was Peorian loess containing between about 28 and 36 percent calcium carbonate equivalent, very similar to the parent material of the Clary soils included in this study. Native vegetation and oxidation or internal drainage were also similar to Clary.

On the basis of 1,800 years as the age of the Indian mounds, Li found that leaching of carbonates had progressed at a rate of 50.4 pounds per acre per year from the surface 1-inch layer and at an average rate of 27.0 pounds per acre-inch per year for the soil solum (about 15 inches in the mounds). He calculated that about 4,000 years would be required to remove the carbonates to a 30-inch depth in these well-drained sites. On the basis of the more recent age estimates of the Indian mounds, the time needed for removal of the carbonates to 30 inches would be about 2,000 years. Assuming that the rate of leaching of the second 30-inch section (and deeper) would be about one-half that of the first 30 inches and that all other conditions were comparable, the time required to leach carbonates to a depth of 58 inches, such as in the Clary soil from Woodford County (Profile No. 13), would be about 6,000 years, and to a depth of 80+ inches, such as in the Clary soil from Tazewell County (Profile No. 12), would be about 9,000 years or somewhat more.

A summary of available information indicates that the soils included in this study have been weathering at least 6,000 to 7,000 years, but probably more nearly 11,000 to 12,000 years according to radiocarbon datings, or between about 8,000 to 10,000 and 18,000 to 20,000 years, according to certain geological evidence.

Characteristics of Calcareous Peorian Loess in the Area Studied

Peorian loess is one of the most uniform soil parent materials in northwestern Illinois, although some differences exist in color, carbonate content, depth of leaching, and other properties. Major differences among the deep loess soils in the area are related primarily to natural drainage, or oxidation, native vegetation, and degree of soil development, rather than to differences in the parent loess. However, in order to completely understand many of the soil profile features, it is necessary to know some of the important characteristics of the unweathered or nearly unweathered material believed to be the same as or very similar to the soil parent material.

Particle Size Distribution or Texture

The predominant texture of calcareous Peorian loess is **silt loam,** usually with less than 5 percent sand, between 75 and 85 percent silt, and between 12 and 20 percent clay, see data in Appendix. Percentages of sand, silt, and clay in selected samples are given in Table 4. Some of the data are slightly outside of

Table 4. — Particle Size Distribution and Color of Calcareous Peorian Loess in Northwestern Illinois

Profile site no.	County	Depths	Total sand	Coarse silt	Fine silt	Total silt	Total clay	Predominant color
		inches	%	%	%	%	%	*Munsell notation*
2[a]	Henderson	95–105	9.0	62.5	18.2	80.7	10.3	10YR 4/4, 5/6 and 2.5Y 6/2
3[a]	Carroll	96–108	4.8	47.6	33.5	81.1	14.1	10YR 5/4-6/4
4[b]	Ogle	56–73	6.7	59.1	23.9	83.0	8.3	10YR 5/4-5/5
9[c]	La Salle	46–66	8.8	51.0	29.3	80.3	10.9	10YR 5/4, 5/6, 6/2
10[a]	Henderson	66–100[e]	2.9	42.7	35.8	78.5	18.6	2.5Y 6/2
13[d]	Woodford	58–95	5.3	38.0	40.3	78.3	15.5	10YR 5/4-6/4
16[d]	Woodford	41–85	3.8	47.8	35.1	82.9	11.1	10YR 5/4, 5/6, 5/8, 6/2, 7/2
17[d]	McLean	41–70[e]	1.8	21.6	50.0	71.6	24.6	10YR 5/6, 5/8, 6/2
19[a]	Mercer	69–80[e]	2.1	60.2	24.6	84.8	13.2	10YR 6/1
20[a]	Mercer	60–74[e]	2.3	46.4	30.6	77.0	20.8	2.5Y 6/2
23[a]	Warren	76–145[e]	1.8	44.2	37.6	81.8	16.4	2.5Y 5/2, 6/2
26[b]	Winnebago	75–110	1.9	45.9	37.6	83.5	12.3	10YR 5/4
27[a]	Mercer	106–120[e]	1.3	37.0	44.3	81.3	17.5	10YR 5/6, 5/8 and 2.5Y 6/2
28[c, d]	Putnam	68–82	5.0	58.2	27.8	86.0	9.0	10YR 5/2, 5/5
29[c]	Henry	65–113[e]	2.2	46.5	37.0	83.6	14.2	10YR 5/6, 5/8
29[c]	Henry	113–174[e]	1.9	50.1	35.4	85.6	12.6	Banded 2.5Y 5/2, 6/2 and 10YR 5/4-5/6
29[c]	Henry	174–226[e]	.6	41.9	46.7	88.6	10.7	5Y 4/1, 5/1
30[a]	Warren	59–71	1.5	37.5	39.4	76.9	21.6	2.5Y 6/1
32[a]	Warren	74–122[e]	2.6	44.7	36.1	80.8	16.6	5Y 6/1, 6/2 and 10YR 5/6, 5/8
33[a]	Warren	57–89[e]	.9	45.8	39.3	85.1	14.0	2.5Y 6/2 and 5Y 6/2
34[c]	Henry	53–72	1.3	34.9	42.8	77.7	21.0	2.5Y 6/2-5Y 6/1
35[d]	McLean	49–60	1.8	34.2	44.8	79.0	17.6	10YR 5/1, 5/6, 6/2

Sampling sites located in areas assumed to have received loess primarily from:

[a] Mississippi River glacial flood plain;

[b] Rock River valley area;

[c] Green River basin;

[d] Illinois River glacial flood plain;

[e] Two or more sampling layers with average data, others are one sampling layer only.

Table 5. — Carbonate Content of Calcareous Peorian Loess by Assumed Predominant Source Area

Mississippi River valley			Illinois River valley			Rock River valley			Green River basin		
Site no.	Depth (in.)	$CaCO_3$ equiv. (%)	Site no.	Depth (in.)	$CaCO_3$ equiv. (%)	Site no.	Depth (in.)	$CaCO_3$ equiv. (%)	Site no.	Depth (in.)	$CaCO_3$ equiv. (%)
1	75–90	13.0	13	58–95	19.7	4	56–73	33.8	9	46–66	24.0
2	95–105	16.0	16	41–85	27.9	26	75–110	25.2	29	65–138	16.4[a]
3	96–108	17.3	17	41–70	22.9[a]				29	145–205	26.9[a]
10	66–100	13.0[a]	28	53–82	23.0[a]				29	205–226	15.0[a]
19	69–80	13.0[a]	35	49–60	16.8				34	53–72	11.0
20	60–74	11.5[a]							(b)	60–65	15.0
23	73–145	13.1[a]									
27	92–120	9.3[a]									
30	59–71	17.0									
32	74–129	16.0[a]									
33	57–89	16.0[a]									
Range		9.3–17.3			16.8–27.9			25.2–33.8			11.0–26.9
Average		14.1			22.1			29.5			18.1

[a] These data are averages of two or more samples.
[b] Sample from unnumbered site in south-central Lee County.

the above ranges, but with only a very slight change in texture; e.g., samples from profile sites 2, 4, 9, 16, 28, and lower part of No. 29 contain less than 12 percent clay and are in the **silt** textural class rather than silt loam.

Although total silt is always high, the relationship of coarse silt (0.05-0.02 mm.) to fine silt (0.02-0.002 mm.) varies not only among samples from different sites but also among samples from different depths at the same site. In a majority of cases the loess adjacent to the Mississippi valley contains more coarse silt than fine silt, whereas the reverse tends to be true in the loess along Illinois River valley. Variations are too numerous among samples from both areas to draw a definite conclusion. The same is true of samples from near Rock River valley and those having a probable source of material in the Green River basin.

In samples from profile site No. 29, Appendix and Table 4, the upper one-third of calcareous loess which is primarily yellowish brown, has a ratio of average percentages of coarse silt to fine silt of 1.24 to 1; the more or less banded middle one-third has a ratio of 1.41 to 1; whereas the lower one-third, which is all gray to dark gray, has a ratio of 0.91 to 1. This would seem to indicate a relationship of the loessial material in the upper two-thirds of the section to the Mississippi valley and the lower one-third to the Illinois valley. On the other hand, the high calcium carbonate equivalent (probably primarily magnesium carbonate) in 10 of the lower 13 samples of this section would indicate a close relationship of this lower part to material along Rock River valley (Table 5).

In some profiles both coarse clay (0.002-0.0002 mm.) and fine clay (<0.0002 mm.) were determined. These data are given in the Appendix. As a general average the ratio of coarse clay to fine clay in calcareous Peorian loess is about 1 to 1. However, in some samples coarse clay percentage slightly exceeds fine clay, but in others fine clay percentages are greatest. Relatively high clay contents, such as the 24.6 percent (average of two samples) in the calcareous loess under Profile 17 (Table 4) are probably caused in part by clay movement from overlying horizons into the unleached material.

Color

The predominant color of Peorian loess in northwestern Illinois is yellowish brown (10YR 5/4, 5/6, or 5/8), especially in the upper portion. In moderately well to imperfectly drained soil areas where the loess is thick, the upper part is yellowish brown and the lower part is usually grayish (2.5Y 6/1-6/2 or 5Y 5/1-6/2). Sometimes a banded zone of gray and yellowish brown occurs between these two layers (see Profile 29, Table 4, and Appendix). The yellowish-brown upper layer is probably the Richland loess of Frye, Glass, and Willman (1962) and the lower gray zone is at least partly their Morton loess (Fig. 3). These zones correspond approximately to the Tazewell and Iowan loesses, respectively, of Leighton and Willman (1950). There is evidence that calcareous Richland loess, which was deposited in swampy areas and remained under poor natural drainage, is grayer or more mottled with gray than that in well-drained areas.

Iron "pipestem" concretions are often present in some of the grayish loess (Fig. 7). These are thought to have formed in large pores or voids such as those left by the decay of roots.

Carbonate Content

Carbonate content of calcareous loess underlying the B horizon was determined for a number of the profiles studied. Percentages of carbonates calculated

Iron concretions (pipestems) in a gray zone of calcareous Peorian loess exposed by erosion. (Fig. 7)

as calcium carbonate equivalent are given in the Appendix. Selected data are given in Table 5. Overall range in carbonate content is from 1.0 to 33.8 percent. Data less than about 8.0 percent are not included in this discussion because of possible excessive leaching loss.

Calcareous loess predominantly from the Mississippi valley source area is lower in carbonates than that from the Illinois River valley, the Rock River valley, or the Green River basin, although overlap is considerable among the four areas (Table 5). Average carbonate content is 14.1 percent in Mississippi valley loess, 22.1 percent in Illinois valley loess, 29.5 percent in that from the Rock River valley, and 18.1 percent in that from the Green River basin area. It is not likely that any of the soils studied developed in loess derived exclusively from a single source. It is probable that the loess in the Illinois River valley includes some from the Mississippi and Green River basin areas. The two sites (No. 4 and 26) indicated as having a loess source in the Rock River valley undoubtedly also had some influence from the Mississippi valley source area, although the high carbonate content in the lower part of the loess of these profiles compared with that in loess closer to the Mississippi shows the probable principal source as the Rock and Pecatonica river valleys where contributions to the source sediments from Niagaran dolomite could have been considerable.

Bulk Density

Only a few bulk density measurements were made on calcareous loess samples in the profiles studied. Values ranged from 1.41 to 1.58 g./cc., with an average of 1.49.

Organic Carbon and Organic Matter

Organic carbon content of calcareous loess underlying soils in northwestern Illinois is generally low, ranging from 0 to about 0.3 percent (see Appendix). The data indicate that this loess material contains no more than about 0.5 percent organic matter and most of the samples analyzed contained less than 0.3 percent.

Permeability

Loess is generally considered a permeable soil material, yet most laboratory tests indicate it has low hydraulic conductivity or low rate of water transmission. The small amount of data on calcareous loess in this study indicate hydraulic conductivity rates ranging from 0.02 to 0.16 of an inch per hour by the core method, except for a value of 0.88 inch per hour in one sample. Field observations indicate, however, that underdrainage is seldom a problem unless water tables are high because outlets are lacking or because of some impermeable underlying layer.

Moisture-Holding Capacity

From the data available in this study water held by calcareous loess is on the order of 30 percent by weight at ⅓-atmosphere tension and about 10 percent at 15-atmosphere tension. Calculations of the amount of water held between ⅓- and 15-atmosphere tension (that supposedly available to plants) show about 0.30 inch of water per inch of loess when a bulk density of 1.50 g./cc. is assumed.

The available water-holding capacity of loess is higher, in general, than that of glacial till and outwash materials. This high water-holding capacity is associated with the high silt content of loess (Bartelli and Peters, 1959).

Depth of Leaching

Considerable variation exists in the depth of leaching in the soils studied. The Mollisols or dark-colored soils are not as deeply leached of carbonates in general as the Alfisols or light-colored soils, and the more poorly drained soils in each of these groups of soils are not as deeply leached as the better drained soils. Although there is overlap in the data, the poorly and imperfectly drained Mollisols as a group average 60 inches in depth to calcareous loess compared with an average of 76 inches in the combined moderately well- and well-drained Mollisols. The average depth of leaching is 65 inches in the poorly and imperfectly drained Alfisols and 83 inches in the moderately well- and well-drained Alfisols. However, included in these average depths are sites in which Peorian loess was all leached, as well as those maximum sampling depths in noncalcareous loess where depth to free carbonates was not noted.

Engineering Properties

Because of rather uniform grain-size distribution and other relatively uniform physical properties of the parent loess, soils developed in deep loess tend to have very similar engineering properties. Calcareous loess usually has liquid limits between 25 and 36 and plasticity indexes between 6 and 20. It is nonplastic or very slightly plastic and has high porosity and permeability. It tends to lose its bearing strength when wet, and compaction may be difficult unless moisture is closely controlled. It has a high shrinkage factor and medium to very high susceptibility to frost action.

Mineralogy

Most of the information on the mineral composition of the loess in northwestern Illinois is summarized in the literature review under *Peorian Loess,* page 3.

The works of Frye, Glass, and Willman (1962), Jones and Beavers (1964a), and Frye, Glass, and Willman (1968) in studies along the Mississippi and Illinois rivers have shown that there are several strata of Peorian loess. Soils mantling the modern landscape may be developed in several of these strata, especially where the uppermost deposit is thin. The clay fraction of loess, derived at least in part from parent rock sources west of the Mississippi River in the high plains geographic region, is composed primarily of montmorillonite, whereas the clay in loess derived from local rock sources in Illinois and to the north in Wisconsin and Michigan has a high component of illite with chlorite and kaolinite. East from the Illinois River a considerable change occurs in clay mineralogy associated with the diversion of the ancient Mississippi River to its present course some 20,000 years ago. After this epoch, loess deposited along the Illinois River valley had a definite illite and chlorite clay composition. Loess deposited in the area between the Illinois and Mississippi rivers is dominated by montmorillonite derived from floodplains along the Mississippi. A small contribution of the montmorillonite occurring in sediments of the Mississippi River is found in the loess east of the Illinois, having been transported the long distance because of the inherent fine grain size (generally $< 0.2\mu$ in diameter) of montmorillonite.

The mineralogy of the silt and sand fractions of loess has not been studied in as much detail as has clay mineralogy. Frye, Glass, and Willman (1962) studied the sand fraction (0.062-0.250 mm.) of Peorian loess. Their data on the sand fraction are outstanding for their uniformity between drainage systems. Among the heavy minerals (> 2.89 sp. gr.) the igneous minerals hornblende and epidote are conspicuously abundant and potassium-bearing feldspar is on the order of twice as abundant as plagioclase. Their X-ray diffraction intensities for calcite and dolomite suggest that dolomite is the dominant carbonate mineral.

In a study of the silt fraction of loess, Johnson (1961) found relatively good uniformity of ZrO_2, TiO_2, CaO, K_2O, Fe_2O_3, and MnO contents in coarse ($20\text{-}50\mu$) and fine ($2\text{-}20\mu$) silt fractions between Mississippi and Illinois river source areas (see also page 4).

Richland Versus Morton Loess

The contact or break between Richland (Tazewell) and Morton (Iowan) in thick sections of Peorian loess lying beyond Wisconsinan till or outwash has not been established. At this date it is not recognized in the field. It will occur at different depths among various loess sections and perhaps at different points in sections from one area compared with other areas. This latter could be caused by variable direction and velocity of wind during deposition, two or more loess source areas, distance from the various sources, and variable lodging and retention of the loessial material.

A measured thickness of five feet of Morton loess beneath Shelbyville till near the east Tazewell County line (Danvers section, Glass et al., 1964) compared with nearby measurements of nine feet of Richland loess on top of Shelbyville till in central Tazewell County indicates an approximate ratio of 1.0 foot of Morton to 1.8 feet of Richland in this part of the study area. Other measurements in Peoria County, in which 9 to 10 feet of Richland loess on top of Shelbyville drift are compared with 15 to 16 feet of total Peorian loess in the nearby Illinoian drift plain gives a ratio of about 1 to 1.6. In addition, measurements in Stark County where thickness of Richland loess on Woodfordian till (Shelbyville or Bloomington) may also be compared with nearby total Peorian loess on Farmdale loess, which in turn is on a Sangamon paleosol in Illinoian till, give a ratio of about 1 to 1.5. Whether any of these ratios will apply to Peorian loess deposits along the Mississippi River or other loess source areas is questionable.

The presence of two or more grayish zones within the Peorian loess was noted in many deep observations on the Illinoian drift plain lying south of Green River basin. One grayish layer was noted in the deepest sections of loess on top of Woodfordian till in eastern Stark, western Marshall, and central Bureau counties. The calcareous loess in these observations rested directly on pinkish calcareous till. This till is Shelbyville or later according to reports of the Illinois State Geological Survey. Thus the upper yellowish-brown loess and most or all of the uppermost grayish zone (Profile No. 29, Appendix) should be Richland loess and the contact with Morton should be at or below the base of this upper grayish layer, perhaps within the banded zone of Profile 29.

Actual contact between Richland and Morton loesses may be gradual and may never be recognized. It may be important in study of soils where total Peorian loess is thin and soil profile development includes both parts. It is of little known importance in this study of deep loess soils in northwestern Illinois as field observations indicate that the soil sola do not extend through the Richland and into probable Morton loess.

Soil Association Areas of Northwestern Illinois

The colored map (attached inside the back cover of this bulletin) indicates the location and approximate extent of the various important associations of soils found in the area studied. Soils formed in loess five or more feet thick occupy somewhat more than one-half of the area. Descriptions and results of detailed laboratory analyses of the more important of these deep-loess soils are presented in this bulletin. Soils formed in or influenced by water-deposited sediments, glacial till, limestone, sandstone, or shale bedrock and rock residuum are also present, but were not studied.

Areas of the individual soil associations of approximately one square mile or larger are shown on the map. Separations of the various areas were based on soil profile characteristics along with characteristics of the parent material or other substratum material to a depth of five or six feet. In areas of extreme detail, such as in parts of Stephenson, Winnebago, and Ogle counties, many soils are of necessity included in some associations that have characteristics relating them to other associations.

Each association is shown on the map by a distinctive symbol formed by the combination of a number with a letter (e.g., 1A, 1B, 2A, 2B, and so on). Numbers are used to indicate separations based on soil profile differences other than surface color. Letters are used to designate differences in surface color only, i.e., A for dark-colored (prairie) and B for light-colored (forest) soil surfaces.

Each color on the map is distinct for each symbol number (1, 2, 3, and so on), except that plain colors distinguish the A or dark-colored soil areas and a fine black stippled background shows in the B or light-colored soil areas.

Description of Soil Associations

The following brief discussions of the soils are presented in the same order as given in the map legend. A brief outline of some of the important soil features and a table with the names of the important related soils occurring in each association area are included. In general, no mention is made of those soils that are not considered part of the association. Small and often local areas of unrelated soils occur in many of the association areas. All of these soils are listed in the associations to which their characteristics relate them.

Transition (prairie-forest) soil intergrades with moderately dark-colored A horizons and certain thin-solum soils with dark to light A and little or no B are shown in the tables as **A or B** (e.g., 1A or 1B, 2A 2B, and so on). The intergrade soils usually occur in the field as border areas between dark-colored and light-colored soils. The thin-solum soils are found primarily on steep slopes where the A and B horizons may have been partially or completely removed by erosion. Some of these areas or parts of areas are included with A on the colored soil association map, whereas others are included with B. No profile samples of either the prairie-forest intergrades or thin-solum soils were included in this study.

Certain symbols and a number of abbreviations are used in the tables. These are as follows:

† = indicates that series name is tentative in Illinois at this date
> = greater than
< = less than
al. = alluvial
calc. = calcareous
fs. = fine sand
in. = inch or inches
lg. = loamy gravel
mod. = moderate or moderately
ms. = medium sand
noncalc. = noncalcareous
out. = glacial outwash
resid. = rock residuum
sed. = sediment or sediments
sic. = silty clay
sicl. = silty clay loam
sil. = silt loam
sl. = sandy loam
strat. = stratified

(Soil association descriptions begin on page 21.)

Port Byron, Seaton, and associated soils (areas 1A and 1B, light yellow color on map). Soils with weak or indistinct horizonation developed in thick Peorian loess with silt loam (<27% clay) B horizons or without B horizons and found on or near Mississippi River bluffs.

Association areas	Solum and C horizon characteristics	Oxidation or natural drainage class			
		Well	Mod. well	Imperfect	Poor
1A	Dark A, no B, calc. at depths between 15 and 40 in.	——Tallula——			
1A	Dark A, weak B, calc. below a depth of 40 in.	Port Byron	Joy	Biggsville	
1A or 1B	Dark or light A, no B, calc. at <15 in. depth	Hamburg			
1A or 1B	Mod. dark A, weak to mod. B, calc. below 40 in. depth	Mt. Carroll	——Fall——		Edgington
1B	No A or B horizon, calc. to surface	——Bold——			
1B	Light-colored A, no B, calc. at depths between 15 and 40 in.	——Timula——			
1B	Light-colored A, no B, calc. below a depth of 40 in.	——Hopper——			
1B	Light-colored A, weak B, calc. below a depth of 40 in.	Seaton	Decorra		

Note: Chute, a soil derived from calcareous fine sand, is present in some parts of these association areas. Also some paha are present with fine sand cores consisting of No. 11 Area soils.

Muscatine, Fayette, and associated soils (areas 2A and 2B, light blue color on map). Moderately developed deep loess soils with silty clay loam B horizons (27 to 35% clay) and moderate permeability, found adjacent to No. 1 areas, but also extending eastward to Rock River north of Green River basin and to Illinois River valley along the southern and eastern borders of Green River basin.

Association areas	Solum and C horizon characteristics	Oxidation or natural drainage class			
		Well	Mod. well	Imperfect	Poor
2A	Dark A, weak to mod. B, calc. at surface				Harpster
2A	Dark A, weak to mod. B, calc. at depths between 15 and 40 in.	Elkhart			Hartsburg
2A	Dark A, mod. B, calc. below 40 in. depth	——Tama——		Muscatine	Sable
2A or 2B	Mod. dark A, mod. to mod. strong B, calc. below 40 in. depth	——Downs——		Atterberry	Denny
2B	Light-colored A, mod. B. calc. at depths between 20 and 40 in.	Sylvan			
2B	Light-colored A, mod. B. calc. below 40 in. depth	Fayette	Rozetta	Stronghurst	Traer

Ipava, Clinton, and associated soils (areas 3A and 3B, light brown color on map). Moderately to strongly developed deep loess soils with heavy silty clay loam to light silty clay B horizons (35 to 42% clay) and moderate to moderately slow permeability, found to the east and south of the No. 2 areas along the Mississippi valley and Green River basin, and along the Illinois River valley. The lines separating the soils of the No. 2 and No. 3 areas are the least satisfactory of all lines on the map. Not only are some of the same soils found in both areas (e.g., Tama and Sable) but the whole general soil relationship may be changed with further detailed field and laboratory study.

Association areas	Solum and C horizon characteristics	Oxidation or natural drainage class			
		Well	Mod. well	Imperfect	Poor
3A	Dark A, mod. to mod. strong B, calc. below 40 in. depth	Tama		Ipava	Sable
3A or 3B	Mod. dark A, mod. strong B. calc. below 40 in. depth	Sicily		Clarksdale	Denny
3B	Light-colored A, mod. to mod. strong B. calc. below 40 in. depth	Clary	Clinton	Keomah	Rushville

Dodgeville, Dubuque, and associated soils (areas 4A and 4B, orange color on map). Moderately developed soils formed in thin loess and residuum from limestone or dolomite or thin loess and thin till on limestone or dolomite residuum or bedrock with silty clay loam to clay loam upper B and clay lower B horizons, and found primarily in the five northern counties on rolling to steep slopes where limestone or dolomite bedrock is at shallow depths. Minor areas of shale and very minor areas of sandstone soils are included in this association in a few counties.

Association areas	Solum and C horizon characteristics	Oxidation or natural drainage class			
		Well	Mod. well	Imperfect	Poor
4A	Dark A, mod. B in loess and resid. on limestone at depths between 20 and 40 in.	Dodgeville			
4A	Dark A, mod. B in loess and resid. on limestone at depths between 40 and 60 in.	Ashdale			
4A	Dark A. mod. B in loess and till on limestone or resid. at depths between 40 and 60 in.	Hitt			
4A or 4B	Dark A, weak B, bedrock at less than 15 in. depth	Sogn			
4A or 4B	Mod. dark A, mod. B in loess and resid. on limestone at depths between 40 and 60 in.	Nasset			
4A or 4B	Mod. dark A, mod. B in loess and till on limestone or resid. at depths between 40 and 60 in.	Oneco			
4B	Light-colored A, mod. B in loess and resid. on limestone at depths between 20 and 40 in.	Dubuque			

Association areas	Solum and C horizon characteristics	Oxidation or natural drainage class			
		Well	Mod. well	Imperfect	Poor
4B	Light-colored A, mod. B in loess and resid. on limestone at depths between 40 and 60 in.	Palsgrove			
4B	Light-colored A, mod. B in loess and till on limestone or resid. at depths between 40 and 60 in.	Woodbine			

Dubuque-Derinda complex (areas 4B-5B, alternating bands of orange and yellow colors on map). Moderately developed soils formed in thin loess and residuum from limestone or shale or both, with silty clay loam upper B and clay lower B horizons. This complex of soils shown on the map only in Jo Daviess County is also found in small areas in Carroll and Stephenson counties where Maquoketa shale lies beneath remnants of Niagaran dolomite and on top of Galena limestone and dolomite. Bedrock and residuum of both shale and limestone or dolomite are at shallow depths or are exposed on many of the steeper slopes in spots or areas too small to show separately on the accompanying map. For names of the soils found in these areas, see table of soils in association Areas 4 above and association Areas 5 following.

Schapville, Derinda, and associated soils (areas 5A and 5B, medium yellow color on map). Moderately developed soils formed in thin loess and residuum from calcareous shale, with silty clay loam moderately permeable upper B, and clay very slowly permeable lower B horizons, and found primarily in Jo Daviess, Stephenson, and Carroll counties but with minor areas elsewhere, many of which were too small to outline on the map. Much of the 5A area in western Bureau County has been strip mined and so has part of the area in northern Peoria County.

Association areas	Solum and C horizon characteristics	Oxidation or natural drainage class			
		Well	Mod. well	Imperfect	Poor
5A	Dark A, mod. B, shale or resid. at depths between 15 and 30 in.	——Schapville——		Shullsburg	Calamine
5A	Dark A, mod. B, shale or resid. at depths between 30 and 50 in.	——Keltner——		Loran	
5A or 5B	Dark or light A, no B, shale or resid. at <15 in. depths	——Shale rockland——			
5A or 5B	Mod. dark A, mod. B, shale or resid. at depths between 15 and 30 in.			Gratiot[†]	
5A or 5B	Mod. dark A, mod. B, shale or resid. at depths between 30 and 50 in.	——Massbach——		Ridott	
5B	Light-colored A, mod. B, shale or resid. at depths between 15 and 30 in.	——Derinda——			
5B	Light-colored A, mod. B, shale or resid. at depths between 30 and 50 in.	——Eleroy——			

Durand,[1] Pecatonica, and associated soils (areas 6A and 6B, yellowish orange color on map). Moderately developed soils formed in thin loess and glacial till of sandy loam or loam texture (where unleached), with silty clay loam upper B and sandy clay loam, clay loam, or gritty silty clay loam lower B horizons, moderately permeable, and found primarily in Ogle, Stephenson, and Winnebago counties.

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[1] Durand has been correlated in Illinois subsequent to the printing of the legend on the Soil Association Map.

Association areas	Solum and C horizon characteristics	Oxidation or natural drainage class			
		Well	Mod. well	Imperfect	Poor
6A	Dark A, mod. B, till at <15 in. depth, calc. sl. at depths between 20 and 42 in.	Griswold			
6A	Dark A, mod. B, till at <15 in. depth, calc. sl. below 42 in. depth	Winnebago[†]			
6A	Dark A, mod. B. till at <15 in., calc. loam at depths between 18 and 24 in.	LaRose			
6A	Dark A, mod. B, till at <15 in., calc. loam at depths between 24 and 42 in.	Parr	Corwin	Odell	
6A	Dark A, mod. B, till at <15 in. depth calc. loam below 42 in.	Sidell	Dana	Raub	
6A	Dark A, mod. B, till at depths between 15 and 30 in. calc. sl. at <45 in.	Ringwood			
6A	Dark A, mod. B, till at depths between 15 and 25 in., calc. sl. below 45 in.	Durand			
6A	Dark A, mod. B, till at depths between 25 and 60 in., calc. sl. below 42 in.	Ogle			
6A	Dark A, mod. B, till at depths between 30 and 60 in. calc. loam below 42 in.	Catlin		Flanagan	Drummer
6A or 6B	Mod. dark A, mod. B, till at depths between 15 and 25 in., calc. sl. below 45 in.	Argyle		Beaver	
6A or 6B	Mod. dark A, mod. B, till at depths between 25 and 60 in., calc. sl. below 45 in.	Myrtle			
6A or 6B	Mod. dark A, mod. B, till at depths between 30 and 60 in. on calc. loam	Atlanta[†]		Sunbury	
6B	Light-colored A, weak to no B, till at <15 in. depth, calc. sl. or loam <18 in.	Hennepin			
6B	Light-colored A, mod. B, till at <15 in. depth, calc. sl. between depths of 15 and 42 in.	Lapeer			

Association areas	Solum and C horizon characteristics	Oxidation or natural drainage class			
		Well	Mod. well	Imperfect	Poor
6B	Light-colored A, mod. B, till at <15 in. depth, calc. sl. below 42 in. depth	Westville			
6B	Light-colored A, mod. B, till at <15 in. depth, calc. loam between depths of 24 and 42 in.	Miami	Celina[†]	Crosby[†]	
6B	Light-colored A, mod. B, till at <15 in. depth calc. loam below 42 in.	Russell	Xenia	Fincastle	
6B	Light-colored A, mod. B, till at depths between 15 and 30 in., calc. sl. at <45 in.	McHenry			
6B	Light-colored A, mod. B, till at depths between 15 and 25 in., calc. sl. below 45 in.	———Pecatonica———			
6B	Light-colored A, mod. B. till at depths between 25 and 60 in., calc. sl. below 45 in.	——— Flagg ———			
6B	Light-colored A, mod. B, till at depths between 30 and 60 in. calc. loam below 42 in.	———Birkbeck———		Sabina	Ward

Saybrook, Dodge,[1] and associated soils (areas 7A and 7B, pink color on map). Moderately developed soils formed in till of loam to silt loam texture (where unleached) or in thin loess and till, primarily with silty clay loam upper B and clay loam or gritty to pebbly silty clay loam lower B horizons, moderately permeable, and found in north-central Woodford, northwestern La Salle, central and eastern Lee, and southeastern Ogle counties. Other small areas are shown on the map in Bureau, Marshall, and McLean counties but additional small local areas not shown on the map occur elsewhere.

Association areas	Solum and C horizon characteristics	Oxidation or natural drainage class			
		Well	Mod. well	Imperfect	Poor
7A	Dark A, mod. B, till at <15 in., calc. loam at depths between 18 and 24 in.	LaRose			
7A	Dark A, mod. B, till at <15 in. calc., loam between 24 and 42 in. depths	Parr	Corwin	Odell	
7A	Dark A, mod. B, till at depths between 15 and 36 in. calc. loam between 24 and 42 depths	———Saybrook———		Lisbon	Drummer
7A or 7B	Mod. dark A, mod. B, till at <15 in., calc. loam till at <42 in. depth	———Montmorenci———		Otterbein	
7A or 7B	Mod. dark A, mod. B, till at depths between 15 and 36 in., calc. loam between 24 and 42 in.			Herbert	

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[1] Dodge has been correlated in Illinois subsequent to the printing of the legend on the Soil Association Map.

Association areas	Solum and C horizon characteristics	Oxidation or natural drainage class			
		Well	Mod. well	Imperfect	Poor
7B	Light-colored A, weak to no B, till at <15 in., calc. loam at <18 in. depth	——— Hennepin ———			
7B	Light-colored A, mod. B, till at <15 in. calc. loam at depths between 18 and 24 in.	Strawn			
7B	Light-colored A, mod. B, till at <15 in. calc. loam at depths between 24 and 42 in.	Miami	Celina[†]	Crosby[†]	
7B	Light-colored A, mod. B, till at <15 in., calc. loam below 42 in. depth	Russell	Xenia	Fincastle	
7B	Light-colored A, mod. B, till at depths between 15 and 36 in., calc. loam between 24 and 42 in.	Dodge			

Saybrook-Dickinson complex (area 7A-14A, alternating bands of pink and lavender colors on map). The area of this complex of soils is in north-central Bureau and southwestern Lee counties. The largest part of the area consists of dark-colored, moderately developed, till-derived soils as described above for Association 7 areas. These are interspersed with sandy soils of varying thickness and development. Pockets of sand occur at the surface or at various depths in the till and mixed with the till to such an extent that a well-defined separation between the two groups of soils could not be shown on the accompanying map. For names of soils involved see table of soils in Association Areas 7 above and Association Areas 14 on page 30.

Varna, Morley, and associated soils (areas 8A and 8B, light yellowish green color on map). Moderately developed soils formed in thin loess (or possibly no loess) and till of silty clay loam texture (where unleached), with silty clay loam to silty clay B horizons, moderately to slowly permeable, and found primarily in La Salle, eastern Marshall, and northeastern Woodford counties. Other areas occur in Stephenson, Lee, Ogle, McLean, and Putnam counties, some too small to show on the map.

Association areas	Solum and C horizon characteristics	Oxidation or natural drainage class			
		Well	Mod. well	Imperfect	Poor
8A	Dark A, mod. B, till at <30 in., calc. sicl. at depths between 20 and 42 in.	——— Varna ———		Elliott	Ashkum
8A	Dark A, mod. B, till at depths between 30 and 60 in., calc. sicl. below 42 in.	——— Catlin ———		Flanagan	Drummer
8A or 8B	Mod. dark A, mod. B, till at <30 in., depth, calc. sicl. at <42 in.	——— Markham ———		Beecher	
8A or 8B	Mod. dark A, mod. B, till at depths between 30 and 60 in., calc. sicl. below 42 in.	——— Atlanta[†] ———		Sunbury	
8B	Light-colored A, weak to no B, calc. sicl. till at <15 in. depth	——— Chatsworth ———			

Association areas	Solum and C horizon characteristics	Oxidation or natural drainage class			
		Well	Mod. well	Imperfect	Poor
8B	Light-colored A, mod. B, till at <30 in., calc. sicl. at depths between 15 and 42 in.	———	Morley ———	Blount	
8B	Light-colored A, mod. B, till at depths between 30 and 60 in., calc. sicl. below 42 in.	———	Birkbeck ———	Sabina	Ward

Rutland[1] **and associated soils** (areas 9A, reddish-brown color on map). Moderately developed soils formed in thin loess and till of silty clay texture (where unleached) with silty clay loam to silty clay B horizons, slowly permeable, and found in southern La Salle, eastern Marshall, and northeastern Woodford counties.

Association areas	Solum and C horizon characteristics	Oxidation or natural drainage class			
		Well	Mod. well	Imperfect	Poor
9A	Dark A, mod. B, till at <30 in. calc. sic. at <42 in. depth			Swygert	Bryce
9A	Dark A, mod. B, calc. sic. till at depths between 30-60 in.	———	Wenona ———	Rutland	Streator

Proctor, Camden, and associated soils (areas 10A and 10B, light green color on map). Moderately developed soils in thin loess (or possibly no loess) and medium to fine-textured water-deposited sediments, with silty clay loam to clay loam or silty clay to clay B horizons, moderately to slowly permeable, and found widely distributed in northwestern Illinois but primarily in Green River basin in Bureau, Henry, Lee, and Whiteside counties, and on terraces along some parts of Rock, Illinois, and Mississippi rivers and most of the smaller streams.

Association areas	Solum and C horizon characteristics	Oxidation or natural drainage class			
		Well	Mod. well	Imperfect	Poor
10A	Dark A, mod. B, gritty out. at <40 in. calc. at depths below 40 in.	———	Proctor ———	Brenton	
10A	Dark A, mod. B, loess between 40 and 60 in. thick on gritty out. or sl. till	———	Plano ———	Elburn	Drummer
10A	Dark A, mod. B, loess or silty out. <24 in. thick on sic. to clay strat. lakebed sed.			Denrock	
10A or 10B	Mod. dark A, mod. B, gritty out. at <40 in. calc. at depths below 40 in.	———	Harvard ———	Millbrook	Thorp
10A or 10B	Mod. dark A, mod. B, loess between 40 and 60 in. thick on gritty out. or sl. till	———	Batavia ———	Virgil	Knight

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[1] Rutland has been correlated in Illinois subsequent to the printing of the legend on the Soil Association Map.

Association areas	Solum and C horizon characteristics	Oxidation or natural drainage class			
		Well	Mod. well	Imperfect	Poor
10A or 10B	Mod. dark A, mod. B, loess or silty out. <24 in. thick on sic. to clay lakebed sed.				Niota
10B	Light-colored A, mod. B, gritty out. at <40 in., calc. at depths below 40 in.	Camden		Starks	Sexton
10B	Light-colored A, mod. B, loess between 40 and 60 in. thick on gritty out. or sl. till	St. Charles		Kendall	
10B	Light-colored A, mod. B, loess or silty out. <24 in. thick on sic. to clay lakebed sed.		Colp	Hurst	Zwingle

Ideal,[1] Wysox,[2] and associated soils (areas 11A, and 11B, brown color on map). Weakly developed soils formed in thin loess and fine sand, with silt loam upper B and fine sandy loam to loamy fine sand lower B horizons, moderately rapid to rapid permeability, and found primarily along the Mississippi valley on upland or high terrace areas where wind- and water-deposited sand is covered with 1 to 5 feet of coarse silty textured loess. The 11A area in north-central Whiteside and southwestern Carroll counties consists mostly of thin loess on sand but also includes some thin loess on till, part of which is calcareous.

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[1] Ideal soils are now correlated as Port Byron, sandy substratum soils.

[2] Wysox soils are now correlated as Tell soils.

Note: Chute, a soil derived from calcareous fine sand, is present in some parts of these association areas. Also some paha are present with fine sand cores that consist of one or more of these soils.

Association areas	Solum and C horizon characteristics	Oxidation or natural drainage class			
		Well	Mod. well	Imperfect	Poor
11A	Dark A, weak B, fs. at depths between 12 and 36 in.	Waukegan			
11A	Dark A, weak B, fs. at depths between 36 and 60 in.	Ideal			
11B	Light-colored A, weak B, fs. at depths between 12 and 36 in.	Wysox			
11B	Light-colored A, weak B, fs. at depths between 36 and 60 in.	Seaton, sandy substratum			

Pilot,[1] Thebes, and associated soils (areas 12A and 12B, brownish-red color on map). Moderately developed soils in thin loess and fine to medium sand, with silty clay loam upper B and sandy loam to fine sandy loam or loamy sand to loamy fine sand lower B horizons, moderate to moderately rapid permeability, found primarily in the southern part of Green River basin in Henry County, along the south side of Edwards River valley in Henry and Mercer counties, and in southern Tazewell County. The two westerly 12A areas in Green River basin in Henry County consist partly of dark soils with silt loam upper B horizons and are related to soils in 11A areas.

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[1] Pilot soils are now correlated as Pillot soils.

Association areas	Solum and C horizon characteristics	Oxidation or natural drainage class			
		Well	Mod. well	Imperfect	Poor
12A	Dark A, mod. B, in loess on fs. to ms. at depths between 20 and 40 in.	Pilot[1]		2	2
12A	Dark A, mod. B, in loess on fs. to ms. at depths between 40 and 60 in.	2	2	2	2
12A or 12B	Mod. dark A, mod. to strong B, in loess on fs. to ms. at depths between 24 and 45 in.				Orio
12A or 12B	Mod. dark A, mod. to strong B, in loess on fs. to ms. at depths between 45 and 60 in.			2	Thorp
12B	Light-colored A, mod. B, in loess on fs. to ms. at depths between 20 and 40 in.	Thebes		Tamms	
12B	Light-colored A, mod. B, in loess on fs. to ms. at depths between 40 and 60 in.	2			

[1] Pilot soils are now correlated as Pillot soils.
[2] These soils are being mapped, but are as yet unnamed.

Warsaw, Fox, and associated soils (areas 13A and 13B, red color on map). Weakly to moderately developed soils in thin loess or medium-textured drift on calcareous gravel or loamy gravel, or both, with silty clay loam to clay loam upper B and clay loam to gravelly clay loam or gravelly loam lower B horizons, moderate to rapid permeability, and found on eskers or gravelly terraces in Stephenson, Winnebago, Ogle, and Bureau counties, and along the Illinois River valley. A few small areas not shown on the map occur in other places. The 13A area in northwestern Stephenson County has light-colored surface soils and should be labelled 13B. Parts of a few other 13A areas have light to moderately dark surface horizons.

Association areas	Solum and C horizon characteristics	Oxidation or natural drainage class			
		Well	Mod. well	Imperfect	Poor
13A	Dark A, weak B, calc. lg. at depths between 10 and 24 in.	Lorenzo			
13A	Dark A, mod. B, calc. lg. at depths between 24 and 42 in.	Warsaw		Kane	Will
13A	Dark A, mod. B, lg. at <40 in., calc. at depths below 40 in.	Volinia			
13A	Dark A, mod. B, calc. lg. at depths between 42 and 60 in.	Wea[†]			

Association areas	Solum and C horizon characteristics	Oxidation or natural drainage class			
		Well	Mod. well	Imperfect	Poor
13A or 13B	Dark to light-colored A, weak to no B, calc. gravel at <10 in. depth	Rodman			
13B	Light-colored A, weak B, calc. lg. at depths between 10 and 24 in.	Casco			
13B	Light-colored A, mod. B, calc. lg. at depths between 24 and 42 in.	Fox		Homer	
13B	Light-colored A, mod. B, lg. at <40 in., calc. below 40 in. depth	Ellison			

Dickinson, Lamont, and associated soils (areas 14A and 14B, lavender color on map). Weakly to moderately developed soils in fine to medium sand, with loamy sand or loamy fine sand to sandy loam or sandy clay loam B horizons, rapid permeability, and found primarily as terrace areas along the Mississippi, Illinois, and Rock rivers, and as ridges and dunes throughout the Green River basin. A few small areas of outcropping St. Peters sandstone along the Rock River in central Ogle County were included.

Association areas	Solum and C horizon characteristics	Oxidation or natural drainage class			
		Well	Mod. well	Imperfect	Poor
14A	Dark A, no B to 60 in. depth, ms. or fs. to 60 in.	Sparta		Watseka	Maumee
14A	Dark A, weak B at depths between 40 and 60 in. on ms. or fs.	Ade			
14A	Dark A, weak B at <40 in. depth on ms. or fs. to 60 in.	Dickinson		Hoopeston	Gilford
14A	Dark A, mod. B at <40 in. depth on ms. or fs. to 60 in.	Onarga		Ridgeville	Pittwood
14A or 14B	Mod. dark A, no B to 60 in. depth, ms. or fs. to 60 in.	Oquawka			
14A or 14B	Mod. dark A, weak B at depths between 40 and 60 in. on ms. or fs.	Levan			
14A or 14B	Mod. dark A, weak B at <40 in. depth on ms. or fs. to 60 in.	Billett			
14A or 14B	Mod. dark A, mod. B at <40 in. depth on ms. or fs. to 60 in.	Epworth[†]			Milroy
14B	Light-colored A, no B to 60 in. depth, ms. or fs. to 60 in.	Plainfield		Morocco[†]	Kilbourne

Association areas	Solum and C horizon characteristics	Oxidation or natural drainage class			
		Well	Mod. well	Imperfect	Poor
14B	Light-colored A, weak B at depths between 40 and 60 in., on ms. or fs. to 60 in.	Bloomfield			
14B	Light-colored A, weak B at <40 in. depth on ms. or fs. to 60 in.	Lamont			
14B	Light-colored A, mod. B. at <40 in. depth on ms. or fs. to 60 in.	Alvin		Roby	Ruark

Dark, moderately dark, and light-colored bottomland, bluffwash, and stream terrace soils (areas No. 15A, green color on map). The soils included in these areas vary in surface color from dark to light, in surface and subsoil texture from sand or fine sand to silty clay or clay, and in profile development from none to moderate. No satisfactory separations could be shown on the map because the soils are mostly too intermixed, the individual areas too small, and the patterns too complex, for the scale used. Many of the soils listed under Association areas 10 and possibly also some listed under 11, 12, 13, and 14, occur in Association 15A areas. These are not relisted here. Only those undeveloped to weakly developed soils formed in alluvial (overflow bottomland) or bluffwash sediments are given. The few moderately dark and light-colored soils included with 15A on the map are listed in the following table as 15A or 15B and as 15B.

Association areas	Solum and C horizon characteristics	Oxidation or natural drainage class			
		Well	Mod. well	Imperfect	Poor
15A	Dark A, calc. loam and sil. al. sed. to 40+ in. depth	——DuPage——		——Millington——	
15A	Dark A, calc. sicl. al. sed. to 40+ in. depth			——Calco——	
15A	Dark A, noncalc. loam and sil. al. sed. to 40+ in. depth	——Huntsville——		Lawson	Otter
15A	Dark A, noncalc. sil. to depths between 18 and 40 in. on dark sicl.		——Radford——		
15A	Dark A, noncalc. sil. bluffwash sed. to 40+ in. depth	——Worthen——		Littleton	
15A	Dark A, noncalc. sicl. al. sed. to 40+ in. depth				Sawmill
15A	Dark A, noncalc. sic. to clay al. sed. to 40+ in. depth				Wabash
15A or 15B	Mod. dark A, neutral to calc. sl. to fsl. 24-36 in. thick on sand	——Landes——			
15A or 15B	Mod. dark A, calc. loam and sil. al. sed. to 40+ in. depth		——Dorchester——		
15A or 15B	Mod. dark to dark A, noncalc. sicl. al. sed. to 40+ in. depth	——Allison——		Tice	Beaucoup

Association areas	Solum and C horizon characteristics	Oxidation or natural drainage class			
		Well	Mod. well	Imperfect	Poor
15B	Light-colored A, calc. sil. al. sed. to 40+ in. depth	——Jules——			
15B	Light-colored A, noncalc. sil. al. sed. to 40+ in. depth	——Haymond——		Wakeland	Birds
15B	Light-colored A, noncalc. sil. al. sed. to depths between 18 and 40 in., on dark sicl.	——Arenzville——			

Characteristics of Mollisols Studied

Mollisols are essentially mineral soils that have surface horizons 10 or more inches thick with Munsell color values darker than 3.5 when moist, and organic carbon contents of 0.58 percent or more. In addition, the surface horizon or mollic epipedon must have sufficiently strong structure so that it is not both massive and hard when dry and has a base saturation of more than 50 percent by the ammonium acetate method, with calcium as the dominant cation. Below the mollic epipedon, a mollisol may have an argillic horizon which essentially must have 1.2 times more < 2 micron clay than the A horizon and have more than 50 percent base saturation. If the clay content of the horizon below the mollic epipedon is less than 1.2 times that of the A horizon, but shows some evidence of alteration, then the horizon is said to be a cambic horizon. Sable, Hartsburg, and Joy have cambic horizons. Sable and Hartsburg are Haplaquolls, and Joy is a Hapludoll. The Tama, Muscatine, and Ipava series have argillic horizons and are Argiudolls. More information on classification of Mollisols may be found on page 59, and in the present soil classification system, "Soil Classification, A Comprehensive System, 7th Approximation," Soil Survey Staff, USDA (1960).

Previous to the present soil classification system, poorly drained Mollisols were classified as Wiesenboden or Humic Gley soils, and somewhat poorly, moderately well-, and well-drained Mollisols were classed as Prairie, Brunigra, or Brunizem soils, USDA, Yearbook of Agriculture (1938), Thorp and Smith (1949), Smith, Allaway, and Riecken (1950), Simonson, Riecken, and Smith (1952).

Occurrence

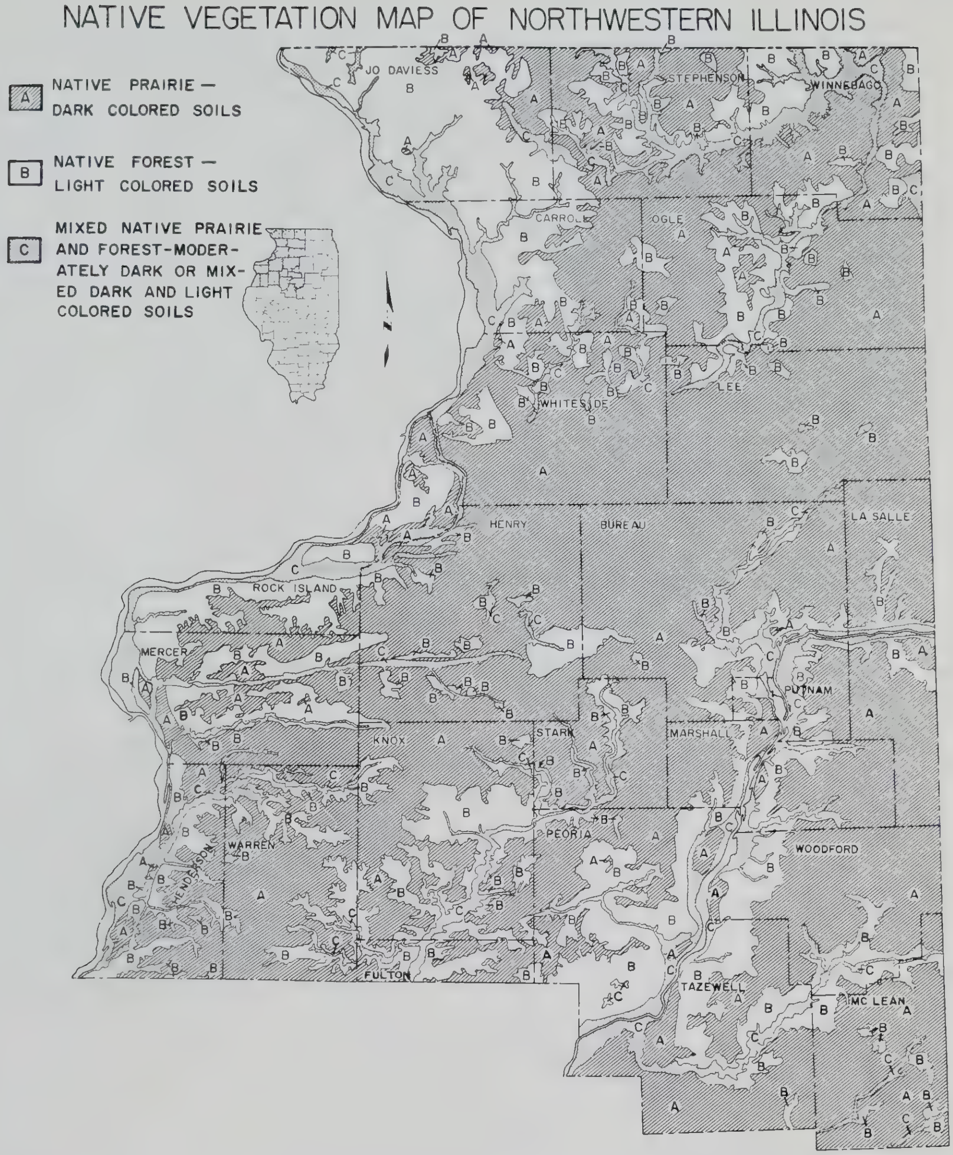
The region of occurrence of the Mollisols in northwestern Illinois is shown in Fig. 8, in area A. It is also indicated on the soil association map of northwestern Illinois (attached inside back cover) by the letter A following the soil association number; for example, 1A, 2A, and 3A. Generally, soil series in areas 1A, 2A, and 3A have developed in loess more than five feet thick. These three soil associations cover approximately 35 percent (4,377 square miles) of the study area.

Soils varying in degree of natural drainage or state of oxidation (as expressed by colors in the soil profile) occur in each of the three soil associations mentioned above. Table 1, page 2, indicates these relationships for the Mollisols studied. In general, moderately well- to well-drained Tama soils have browner colors in the subsoil and occur on sloping land; somewhat poorly drained Joy, Muscatine, and Ipava soils have mottled subsoil colors and occur on nearly level to gently sloping land; and poorly drained Sable and Hartsburg soils have gray subsoil colors and occur on the level to depressional landscape positions.

Two profiles (No. 19 and 20) of Joy silt loam are representative Mollisols in Area 1A. This soil association area comprises about 1 percent of the study area and occurs nearest the loess source areas. In general the loess is more than 25 feet thick. A key to the soils in this area may be found on page 21. These somewhat poorly, moderately well-, and well-drained Mollisols lack a distinct clay accumulation in the subsoil (i.e., they lack an argillic horizon and are weakly developed).

Tama, Muscatine, and Sable soils form a toposequence or catena in soil association area 2A. These soils are formed in loess about 10 to 25 feet thick, have developed under essentially the same climate with similar native vegetation, over approximately the same time span, but differ from each other in topographic occurrence and natural drainage. Soil association 2A is the largest soil association comprising 19 percent of the total study area. In this study, area 2A (Muscatine and associated soils) is represented by three profiles of Tama, five profiles of Muscatine, two profiles of Sable, and one profile of Hartsburg (Table 1, page 2). These soils are moderately developed.

Soil association area 3A (Ipava and associated soils) is represented by one profile of Tama and four profiles of Ipava (Table 1, page 2). It comprises approxi-


NATIVE VEGETATION MAP OF NORTHWESTERN ILLINOIS
A NATIVE PRAIRIE — DARK COLORED SOILS
B NATIVE FOREST — LIGHT COLORED SOILS
C MIXED NATIVE PRAIRIE AND FOREST-MODERATELY DARK OR MIXED DARK AND LIGHT COLORED SOILS
JO DAVIESS
STEPHENSON
WINNEBAGO
CARROLL
OGLE
WHITESIDE
LEE
HENRY
BUREAU
LA SALLE
ROCK ISLAND
MERCER
PUTNAM
KNOX
STARK
MARSHALL
WARREN
HENDERSON
PEORIA
WOODFORD
FULTON
TAZEWELL
MC LEAN

Native vegetation map of northwestern Illinois showing the distribution of prairie (dark colored), forest (light colored), and mixed prairie and forest (moderately dark) soils. (Fig. 8) mately 15 percent of the study area. Loess thickness is generally 5 to 10 feet thick, but in some parts of the area loess is thicker than 10 feet. These soils have argillic horizons and the somewhat poorly drained Ipava soils are more strongly developed than corresponding soils in areas 1A and 2A.

Native Vegetation

The Mollisols in northwestern Illinois were developed under grass vegetation (Fig. 8). Various species of sedges, rushes, and slough grasses grew in the low-lying areas. Gently sloping areas were inhabited mainly by big bluestem, but also had Indian grass, prairie dropseed, and wild indigo among the prairie species present. The climate at present and in the past going back to 2000 to 3000 years B.P. is conducive to a forest type of vegetation. However, the period 4000 to 6000 years B.P. appears to have been better suited to grass. The tough sod produced by the tall growing big bluestem may have suppressed establishment and growth of trees, Smith, Allaway, and Riecken (1950). Prairie fires may also have taken their toll of young tree seedlings, thus aiding perpetuation of the prairie vegetation. Under the present climate and until man disturbed the ecologic equilibrium, forest was invading grassland in the study area. Since cultivation, however, this encroachment has largely stopped.

Morphological Features

A1 or Ap horizons. These are surface horizons which contain humified organic matter intimately associated with the mineral fraction.

The Typic Hapludolls represented by Joy silt loam (No. 19 and 20) have A1 or Ap horizons which average about 13 inches in thickness, are black (10YR 2/1), have granular structure, and have silt loam textures. The Joy soils are considered the least developed of the Mollisols in this study.

The Typic Argiudolls (Tama — No. 21, 22, 23, 24) have A1 or Ap horizons that average nine inches and range from six to ten inches in thickness, are very dark brown (10YR 2/2), have granular structure, and have silt loam textures.

The Aquic Argiudolls (Muscatine — No. 25, 26, 27, 28, 29, and Ipava — No. 33, 34, 35, 36) are somewhat poorly drained soils. The A1 or Ap horizons of Muscatine are very nearly alike and average 15 inches in thickness. Their range in thickness is from 11 to 18 inches. They are black (10YR 2/1) in color, have granular structure, and have silt loam texture. Ipava soils appear to have slightly more clay in the A1 and Ap horizons than Muscatine soils (Fig. 9).

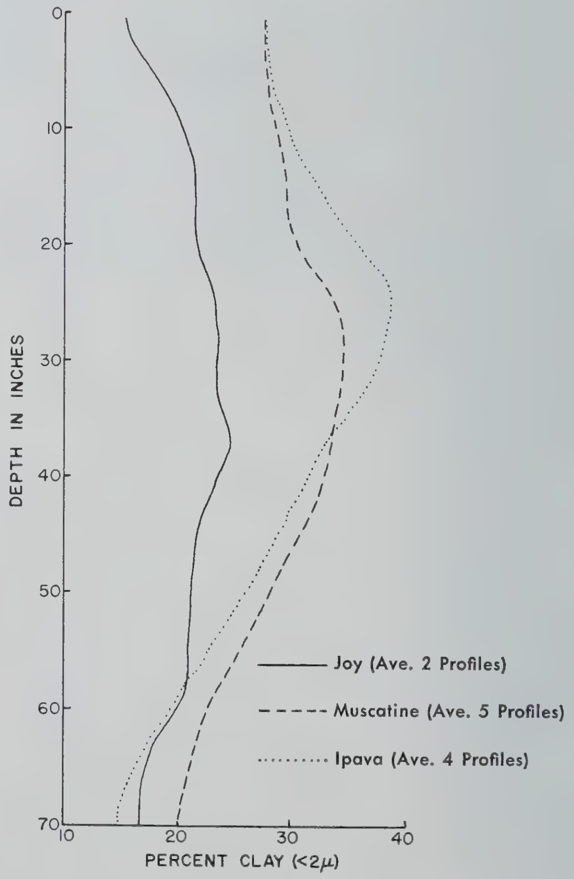
The Typic Haplaquolls (Sable — No. 30, 31) have A1 and Ap horizons which average about 17 inches and range from 15 to 19 inches in thickness. They are black (10YR 1/1 to 2/1), have granular structure, and have silty clay loam textures. These soils are poorly drained and occur in the lower landscape positions and occasionally on higher broad flat areas in the Muscatine and Ipava soil association areas (2A and 3A). Sable in the lower positions will collect finer material washed in from higher surrounding soils.

The Typic Haplaquolls (Hartsburg — No. 32), which are shallow to carbonates, have A1 and Ap horizons which are 13 inches thick, are black (10YR 1/1 to 2/1), have granular structure, and have heavy silt loam textures. These soils are poorly drained and have free calcium carbonate at depths ranging from 15 to 40 inches. Profile 32 has carbonates at 28 inches.

A3-B1 horizons. These horizons are transitional between A and B horizons. A3 horizons are more like A than B, and B1 horizons more like B than A. Frequently both horizons will occur in the same profile. They are both discussed as transitional horizons between A and B.

The Typic Hapludolls (Joy — No. 19, 20) have A3-B1 horizons which average 10 inches in thickness, are very dark gray (10YR 3/1), have granular structure, and have silt loam texture.

The Typic Argiudolls (Tama — No. 21, 22, 23, 24)



Average distribution of clay in Mollisols representing three development stages. (Fig. 9)

have A3-B1 horizons which average 10 inches and range from 8 to 12 inches in thickness. They are very dark grayish brown (10YR 3/2) to dark brown (10YR 3/3) in color, have granular to fine subangular blocky structure, and have heavy silt loam texture.

The Aquic Argiudolls are Muscatine — No. 25, 26, 27, 28, 29 and Ipava — No. 33, 34, 35, 36. Both Muscatine and Ipava have A3-B1 horizons which average seven inches and range from 3 to 11 inches in thickness. Muscatine has colors of very dark brown (10YR 2/2) to very dark grayish brown (10YR 3/2) and Ipava has colors from very dark gray (10YR 3/1) to black (10YR 2/1). Both soil series have fine subangular blocky structure. Texture in Muscatine is light silty clay loam and in Ipava is medium silty clay loam. One of the differences between Muscatine and Ipava is clay content in the B horizon, and the higher clay content in Ipava is apparent in the A3-B1 horizons as well as in B2 horizons.

The Typic Haplaquolls (Sable — No. 30, 31) have A3-B1 horizons which average about six inches thick, are very dark gray (10YR 3/1) to black (10YR 2/1), have fine subangular blocky structure, and have medium silty clay loam textures. This is the zone of maximum clay in the Sable soils.

The Typic Haplaquolls, which are shallow to carbonates (Hartsburg — No. 32) have A3-B1 horizons which are about five inches thick, are very dark gray (10YR 3/1), have fine subangular blocky structure, and have textures of heavy silt loam to light silty clay loam.

B2 horizons. Selected properties of B2 horizons are given in Table 6. With the exception of the Aquolls, most of the Mollisols in this study have the maximum accumulation of clay, the maximum expression of blocky or prismatic structure, and a concentration of clay films on the ped surfaces in the B2 horizon.

The Typic Hapludolls (Joy — No. 19, 20) have B2 horizons which average 18 inches and range from 17 to 20 inches in thickness. They are brown (10YR 4/3) with some mottling, have medium subangular blocky structure, and have silt loam textures.

The Typic Argiudolls (Tama — No. 21, 22, 23, 24) have B2 horizons which average 21 inches and range from 18 to 25 inches in thickness, are brown (10YR 4/3) to dark yellowish brown (10YR 4/4) without mottling, have fine to medium subangular blocky structure containing some evidence of clay films. They frequently have gray silt speckings on the ped faces and are light to medium silty clay loam.

The Aquic Argiudolls include two soil series, Muscatine — No. 25, 26, 27, 28, 29 and Ipava — No. 33,

Table 6. — Selected Characteristics of B2 Horizons of Mollisols Studied[a]

Series and profile no.	Total thickness (inches)	Depth to middle of horizon of max. clay accum. (inches)	Max. $<2\mu$ clay (%)	% clay in B[b] / % clay in A	% coarse silt / % fine silt	Ca/Mg ratio	Base sat. (%)
Soils with weak development							
Joy (19)	17	26	21.8	1.2	2.4	2.4	81
Joy (20)	20	35	26.4	1.9	1.8	2.7	84
Average	19	31	24.1	1.6	2.1	2.6	83
Soils with moderate development							
Tama (21)	21	31	32.3	1.3	1.0	1.7	79
Tama (22)	25	31	29.3	1.3	1.3	1.2	84
Tama (23)	18	31	30.6	1.7	1.2	1.9	82
Tama (24)	18	24	33.8	1.3	...	1.7	80
Average	21	29	31.5	1.4	1.2	1.6	81
Muscatine (25)	20	31	32.2	1.2	1.1	1.7	80
Muscatine (26)	18	25	34.3	1.3	1.0	1.5	76
Muscatine (27)	23	35	33.6	1.2	.9	2.1	85
Muscatine (28)	11	30	32.7	1.3	1.0	1.7	92
Muscatine (29)	27	28	37.2	1.4	.8	2.1	92
Average	20	30	34.0	1.3	1.0	1.8	85
Sable (30)	14	26	31.0	1.0	1.0	2.4	100
Sable (31)	20	25	32.6	.9	.8	1.9	100
Average	17	26	31.8	1.0	.9	2.2	100
Hartsburg (32)	10	20	25.2	1.0	1.4	3.8	97
Soils with moderately strong development							
Ipava (33)	24	31	36.6	1.6	.8	2.1	88
Ipava (34)	20	24	38.5	1.3	.7	2.0	88
Ipava (35)	12	22	42.1	1.7	.4	1.1	93
Ipava (36)	16	30	38.1	1.3	.7	1.6	92
Average	18	27	38.8	1.5	.7	1.7	90

[a] Weighted according to thickness of B_2 subhorizons.

[b] Ratio of maximum clay in B_2 to minimum clay in A.

34, 35, 36, which are separated mainly on the basis of clay content in the B2 horizon.

The B2 horizons of the Muscatine soils average 20 inches and range from 11 to 27 inches in thickness. They are dark grayish brown (10YR 4/2) to grayish brown (10YR 5/2) with mottling, have prismatic structure breaking to fine to medium subangular blocky, and have clay films of dark gray (10YR 4/1) to grayish brown (10YR 5/2). They are medium silty clay loam. The zone of maximum clay accumulation occurred at an average depth of 30 inches and contained an average of 34 percent clay, which is one percent more than the average for the entire B2 (Table 6).

The B2 horizons of the Ipava soils average 18 inches in thickness, ranging from 12 to 24 inches. They are essentially dark grayish brown (10YR 4/2) in color with mottling, have prismatic structure breaking to medium subangular blocky and show evidence of clay films of very dark gray (10YR 3/1) to dark gray (10YR 4/1). They are heavy silty clay loams. The zone of maximum clay accumulation occurred at an average depth of 27 inches and contained 39 percent clay, which is 2 percent more than the average for the entire B2 (Table 6).

The Typic Haplaquolls (Sable — No. 30, 31) have B2 horizons averaging 17 inches in thickness and ranging from 14 to 20 inches. They range in color from very dark gray (10YR 3/1) to gray (5YR 5/1) and have mottles ranging from brown (10YR 5/3) to yellowish brown (10YR 5/7). Structure is prismatic breaking mainly to angular blocky and peds have black (10YR 2/1) to very dark gray (10YR 3/1) clay films. Textures are light to medium silty clay loams.

The Typic Haplaquolls, which are shallow to carbonates (Hartsburg — No. 32) have B2 horizons which are about 10 inches thick, are very dark gray (10YR 3/1) to dark grayish brown (10YR 4/2) with mottling, have prismatic structure breaking to angular and subangular blocky structure and contain dark gray (10YR 4/1) clay films. They are silt loams.

B3 horizons. The B3 horizon is a transitional horizon between B and C horizons, but is more like B than C and usually contains less clay and less structural development than B2 horizons. Where B3 horizons occur, they constitute the lower part of the solum.

The Typic Hapludolls (Joy — No. 19, 20) have B3 horizons which average 10 inches and range from 6 to 14 inches in thickness, are brown (10YR 4/3) to gray (2.5Y 6/2) with high chroma mottling. They have weak coarse subangular to angular blocky structure, and are silt loams.

The Typic Argiudolls (Tama — No. 21, 22, 23, 24) have B3 horizons averaging 13 inches thick, ranging from 9 to 18 inches, and are pale brown (10YR 6/3) to yellowish brown (10YR 5/4) in color. They have weak clay films. They are borderline in texture between silt loams and silty clay loams.

The Aquic Argiudolls (Muscatine — No. 25, 26, 27, 28, 29, and Ipava — No. 33, 34, 35, 36) have B3 horizons which are very similar for the two soil series. The B3 horizons in Muscatine average 11 inches thick, are grayish brown (10YR 5/2) to light brownish gray (10YR 6/2) with high chroma mottlings, have weak medium to coarse angular blocky structure with occasional very dark grayish brown (10YR 3/2) to dark grayish brown (10YR 4/2) clay films. They are light silty clay loams. The B3 horizons in Ipava average about 15 inches thick, are grayish brown (10YR 5/2) and light brownish gray (10YR 6/2) with high chroma mottles. They have weak medium to coarse angular blocky structure with occasional dark gray (10YR 4/1) to gray (10YR 5/1) clay films, and are light silty clay loams.

The Typic Haplaquolls (Sable — No. 30, 31) have B3 horizons averaging nine inches thick that are gray (N 5/0 to 10YR 6/1) with mottling. Structure is weak prismatic, breaking to weak coarse angular blocky, with occasional grayish brown (10YR 5/2) clay films. They are heavy silt loams.

The Typic Haplaquolls, which are shallow to carbonates (Hartsburg — No. 32) have B3 horizons about 12 inches thick that are grayish brown (2.5Y 5/2) with mottling. Structure is weak medium to coarse angular blocky with very occasional, very dark gray (10YR 3/1) to dark gray (10YR 4/1) clay films. They are silt loams.

C horizons. The characteristics of the calcareous loess C horizon are discussed on pages 16 to 19. Only the characteristics of the noncalcareous C horizon will be discussed here. C horizons are little affected by pedogenic processes and lack properties diagnostic of A or B horizons. Where present, noncalcareous C, or leached C horizons, occur immediately below the B horizons and above any calcareous C horizons.

The Typic Hapludolls (Joy — No. 19, 20) have leached C horizons which average five inches thick and range from zero to nine inches. They are silt loams and have about 3 percent more clay than the calcareous C below.

The Typic Argiudolls (Tama — No. 21, 22, 23, 24) have leached C horizons ranging in thickness from 25 inches to 45 inches or more, and no carbonates were found in one profile to 100 inches. They are silt loams. Compared with the calcareous C horizon of one profile (No. 23), the average clay in the leached C was about 2 percent higher.

The Aquic Argiudolls (Muscatine — No. 25, 26, 27, 28, 29, and Ipava — No. 33, 34, 35, 36) have leached C horizons which are very similar in color and texture. They are normally mottled in color and are heavy silt loams. Horizon thickness ranges from zero, where carbonates are encountered immediately below the B horizon, to 29 inches in one Muscatine profile (No. 26). Average depth to carbonates is about 12 inches shallower in Ipava than in Muscatine.

The Typic Haplaquolls (Sable — No. 30, 31) vary in thickness of leached C, one (No. 30) having no leached

C and the other having an 11-inch leached C. The leached C horizon had 25 percent clay, 71 percent silt, and 4 percent sand. The calcareous C in the other Sable contained 23 percent clay, 76 percent silt, and 1 percent sand.

The Typic Haplaquolls, which are shallow to carbonates (Hartsburg — No. 32) have no leached C because the carbonates normally occur at depths between 15 to 40 inches and occur in at least the lower part of the B horizon. This Hartsburg profile has a solum 38 inches thick with carbonates at 23 inches. The calcareous C was a silt loam.

Physical Properties

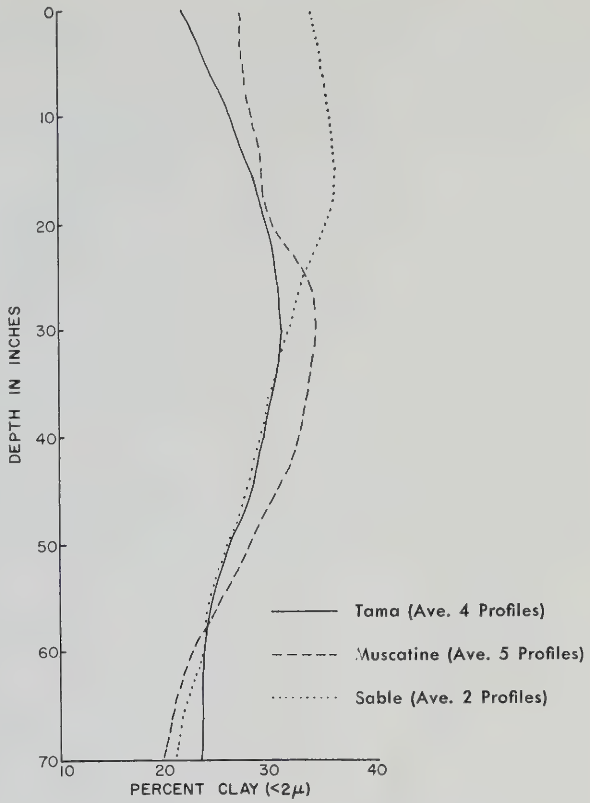
Particle size distribution. Texture, or the amount of sand, silt, and clay in these soils, influences many other properties. The percentage of sand is rather constant with depth in all profiles ranging from 1 to 5 percent, and is similar between different profiles.

The content of silt is high in all profiles, ranging from about 50 to 90 percent and varying correspondingly and inversely with clay content.

The variation in clay content with depth within the profile and between the various profiles is of major importance in the use and classification of Mollisols, and consequently clay contents will be emphasized in the following discussion.

The Joy, Muscatine, and Ipava soils represent a developmental sequence of Mollisols. The clay content in the total B2 horizons increases from an average of 23 percent in Joy, to 33 percent in Muscatine, to 37 percent in Ipava. Average maximum clay in the B2 is about 1 percent above these averages in the three soils (Fig. 9). Joy does not have an argillic horizon while Muscatine and Ipava do. Joy and Muscatine are in the fine-silty family textural class, while Ipava is in the fine family. The increase in clay in the B2 horizon from Joy, to Muscatine, to Ipava is accompanied by a corresponding increase in the grade of soil structure and the amount of clay films on the peds. These properties are related to the thickness of loess, distance from the loess source, and average grain size of the loess. The Joy is developed in more than 25 feet of loess, Muscatine and Ipava are formed in 5 to 25 feet of loess with the average depth in Ipava being a foot or two less than in Muscatine. Typically Joy occurs nearest the loess source, Muscatine at intermediate distances, and Ipava the farthest removed. Joy is seldom found more than five miles from the loess source. The coarse-silt/fine-silt ratio of the B2 horizon (Table 6) ranges from 2.1 for Joy, to 1.0 for Muscatine, to 0.7 for Ipava, further indicating the decrease in particle size with distance from the loess source.

Tama, Muscatine, and Sable form a toposequence of moderately developed Mollisols occurring in soil association area 2A. Figure 10 indicates the average clay distribution for these soils. Although the Sable has more clay in the upper 20 inches of the profile, at the 30-inch depth it has less clay than Muscatine and is nearly equal to that in Tama. The higher content of clay-size material in the upper 20 inches of Sable may be attributed to greater weathering of the mineral fraction caused by water being present for long periods in this poorly drained, low-lying soil. In addition, the lower landscape position would accumulate fine-textured wash from upslope soils. The average clay content in the A1 horizon ranges from 23 percent in Tama, to 27 percent in Muscatine, to 34 percent in Sable, while in the B2 horizon it ranges from 32 percent in Tama, to 34 percent in Muscatine, and 32 percent in Sable (Table 6).



Average distribution of clay in a Mollisol toposequence of moderately developed soils. (Fig. 10)

Bulk density values are available for two profiles each of (Tama — No. 21, 22), (Muscatine — No. 25, 26), (Sable — No. 30, 31), and (Ipava — No. 35, 36). There is essentially no difference in bulk density for a particular horizon in any of the above soils. The average bulk density for the total A horizon ranges from 1.0 in Muscatine, to 1.2 in Sable, and 1.1 in both Tama and Ipava (Table 7).

The total B horizons, likewise, do not show any significant differences in bulk density between the above-mentioned soils with averages of total B horizon ranging from 1.3 to 1.4. The average bulk density for all soils for total B horizons was about 1.35.

C horizon bulk densities are very similar with an average of 1.5.

Table 7. — Selected Physical Properties of Loess Mollisols

Soil series	Average bulk density (g/cc)			Average total porosity (%)			Average capillary porosity (%)			Average non-capillary porosity (%)			Average water retention value to 60 inches (in. of water)	Weighted ave. coarse silt/fine silt ratio		
Major horizon	A	B	C	A	B	C	A	B	C	A	B	C		A	B	C
Joy	...	...	...	...	...	...	...	...	...	...	...	...	...	2.5	2.2	2.2
Tama	1.1	1.3	1.5	59	52	47	40	42	42	19	10	5	15	1.1	1.2	1.1
Muscatine	1.0	1.3	1.5	58	49	51	42	40	47	16	9	4	14	.8	1.0	1.3
Sable	1.2	1.4	1.5	57	47	48	48	40	44	9	7	4	16	1.0	.9	1.0
Hartsburg	...	...	...	...	...	...	...	...	...	...	...	...	16	1.5	1.5	1.2
Ipava	1.1	1.4	1.5	53	47	47	41	40	43	12	7	4	16	.8	.7	.9

In summary, the bulk densities for similar horizons is nearly the same for Tama, Muscatine, Sable, and Ipava, with A horizons averaging 1.1, B horizons 1.35, and C horizons 1.5 (Table 7).

Porosity. Total pore space or total porosity is the part of the soil volume which is not occupied by soil particles. Capillary pore space is that portion of the total porosity which consists of small pores in which water is retained at 60 centimeters of water tension. Noncapillary pore space is the difference between total porosity and capillary porosity, and consists of the larger pores in the soil. Average values for total porosity, capillary porosity, and noncapillary porosity are given for (Tama — No. 21, 22), (Muscatine — No. 25, 26), (Sable — No. 30, 31), and (Ipava — No. 35, 36) in Table 7.

Total porosity does not vary markedly between soils for the major horizons, but does change with depth. In all soils, the total porosity is higher in the surface and decreases with depth. The maximum change with depth occurs in Tama, with 59 percent in the A horizon, 52 percent in the B horizon, and 47 percent in the C horizon. This decrease in porosity with depth is directly related to the increase in bulk density with depth.

Capillary porosity ranges between 40 and 48 percent for all horizons. With the exception of Tama, all soils appear to be slightly lower in capillary porosity in the B horizons as compared with the A or C horizons. Part of this decrease in capillary porosity based on the total soil volume in the B horizon may be caused by the movement of fine clay from the A horizon into the B horizon and the filling of some of the fine pores.

The A horizons are highest and the C horizons are lowest in noncapillary porosity, which ranges from an average of 19 percent in the A of Tama to a low of 4 to 5 percent in the C horizons of all these soils. The toposequence (Tama, well drained; Muscatine, somewhat poorly drained; and Sable, poorly drained) has a non-capillary porosity percentage decrease for all comparable horizons from Tama through Muscatine to Sable. This may be related to the higher moisture or water level status, or both, of the Sable as compared with Tama. Since Sable is water saturated for a longer period of time, there is more likely to be shifting and settling of clay into the larger pores.

Hydraulic conductivity, determined by the core method, is given for some of the Mollisols in the profile data in the Appendix. Many of these values, for example those for Sable (No. 31), are not considered reliable estimates. Sable, Hartsburg, Ipava, and Muscatine soils, which often require drainage, have sufficient hydraulic conductivity for tile to function well.

Water retention values between ⅓ and 15 atmosphere tensions are given in Table 7 for the loess Mollisols except Joy. Values are in inches of water and are additive in this case to a depth of 60 inches.

Water retention values for all Mollisols in this study are quite similar, varying from 14 inches in Muscatine to 16 inches in Sable, Hartsburg, and Ipava. The lower average of 14 inches of water retention in the Muscatine may not be significantly different from that of the other soils since two (Muscatine — No. 27, 29) averaged 12 inches and two other (Muscatine — No. 25, 26) averaged 16 inches. No reason for the lower value in profiles No. 27 and 29 can be indicated at this time.

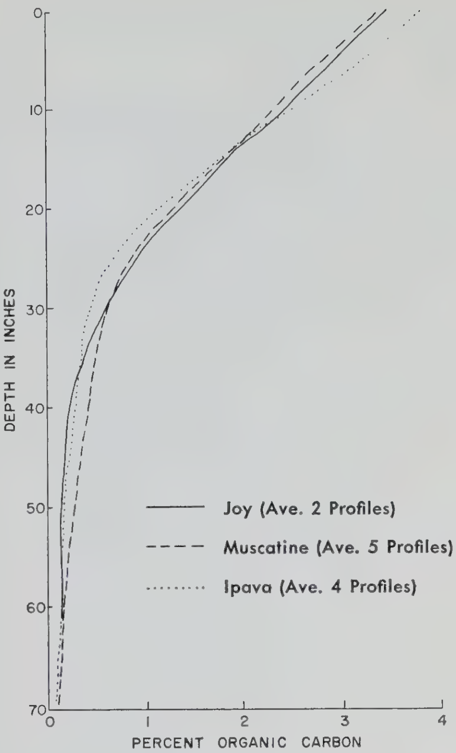
Chemical Properties

Organic carbon content in these Mollisols is high (3 to 5 percent) in the surface, decreasing with depth to low values (0.1 to 0.2 percent) in the lower B and C horizon (Figures 11 and 12). Organic carbon contents for all profiles are listed in the data in the Appendix. Average content for major horizons is shown in Table 8.

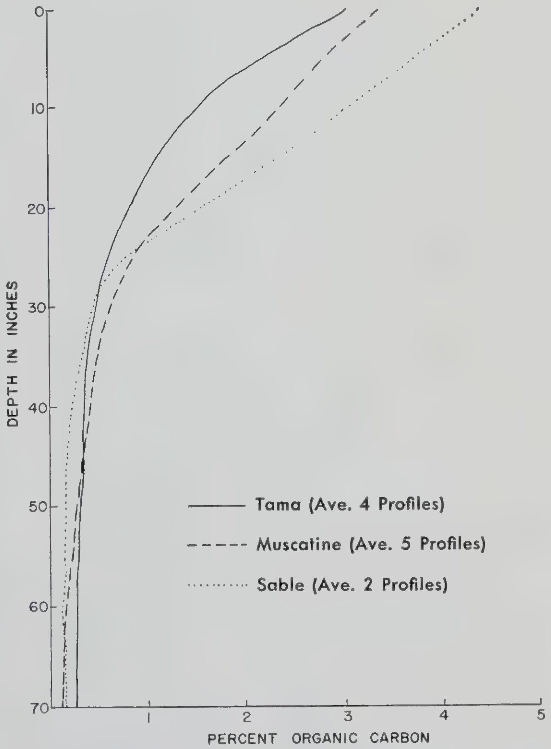
The developmental sequences of the younger Joy to Muscatine to the older Ipava soils show little or no difference in average organic-matter content to a depth of 70 inches (Table 8). The data plotted in Figure 11 are for Mollisols from this study. On page 52, reference is made to the decline of organic carbon with age of soils, but the data referred to (Table 11) involve more soils than are included in this study, and indicate a slight decline in organic matter from Muscatine to Ipava which is not readily apparent in Table 8. It is

Table 8. — Selected Chemical Properties of Loess Mollisols

Soil series	Wt. ave. (% organic carbon)			Wt. ave. (% base saturation)			Weighted average (me./100g. soil)															Wt. ave. Ca/Mg ratio			Soil tests wt. ave. (lb./acre)								
							Exch. Ca			Exch. Mg			Exch. K			Exch. Na			CEC						P_1			P_2			K		
Major horizon	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Joy	2.5	.5	.1	76	85	100	11.0	9.4	10.1	2.9	4.3	5.8	.27	.24	.25	.10	.16	.19	19	17	13	4.0	2.5	1.8	...	...	...	...	...	...	...	...	...
Tama	2.3	.5	.2	80	92	95	9.3	9.6	9.0	3.8	5.8	6.3	.33	.38	.34	.13	.19	.21	17	20	16	2.6	1.7	1.7	63	61	58	69	87	125+	259	370	400
Muscatine	2.7	.5	.1	75	86	99	13.4	13.4	12.1	4.2	7.4	6.7	.44	.43	.28	.17	.18	.18	24	25	17	3.2	1.8	1.6	40	28	13	50	66	133	313	286	202
Sable	3.3	.4	.1	97	100	100	27.6	18.5	14.2	9.8	8.5	7.3	.45	.40	.40	.10	.10	.10	38	26	18	2.9	2.2	2.0	27	14	26	90	161	200+	256	197	242
Hartsburg	2.6	.8	.2	100	96	100	23.5	17.5	...	5.1	4.3	...	.34	.35	...	.12	.10	...	28	23	...	4.7	4.1	...	21	4	2	96	54	23	268	188	185
Ipava	2.6	.5	.2	85	92	100	14.9	14.8	12.3	6.1	9.2	8.2	.37	.41	.26	.11	.18	.16	26	27	18	2.7	1.7	1.6	15	10	3	38	40	122+	257	296	213



Average distribution of organic carbon in Mollisols representing three development stages. (Fig. 11)



Average distribution of organic carbon in a Mollisol toposequence of moderately developed soils. (Fig. 12) known from other studies, however, that organic carbon decreases markedly in more highly developed soils than those of this study.

Organic carbon data from four Tama profiles, five Muscatine profiles, and two Sable profiles (Fig. 12) indicate that to a depth of 28 inches the Sable has the highest organic carbon content, Tama the least, with Muscatine intermediate. The higher organic-matter contents are associated with the higher clay contents and related to the relative amount of surface area involved, clays having higher surface area per unit weight than silts or sands.

pH and base saturation are closely related. As pH increases down through the profile, base saturation increases in proportion. In the developmental sequence, Joy-Muscatine-Ipava, Joy has the lowest pH and base saturation, Muscatine is intermediate, and Ipava is highest. This is an apparent anomaly or contradiction to natural order in that a decline in pH and base saturation is normally associated with increased soil development. Some contributing factors to this anomaly may be that Joy is developed from coarser loess than Ipava and consequently has greater permeability; secondly, the loess is thickest under Joy (usually more than 25 feet), intermediate under Muscatine (approximately 10 to 25 feet) and thinnest under Ipava (approximately 5 to 10 feet) which would cause variation in the permeability effects caused by the presence of an underlying paleosol.

Cation exchange capacity (Table 8) is directly proportional to the amount of clay and organic matter. High clay and organic-matter contents are responsible for high cation exchange capacities. In the drainage sequence, Tama, Muscatine, and Sable, the total A horizon of Tama averages 17 me./100 g. with Muscatine 24 and Sable 38. In this sequence, cation exchange capacity of the A horizon increases as both clay and organic matter increase. In B and C horizons, the cation exchange capacity is primarily a function of clay content.

Exchangeable cations. Calcium, magnesium, potassium, and sodium are the major cations on the clay-organic exchange complex. The order of abundance is as follows: calcium > magnesium > potassium > sodium. Calcium is three to five times greater than magnesium with potassium occurring in moderate and sodium in small amounts. See data in the Appendix and weighted averages for the major horizons in Table 8.

Exchangeable calcium is highest in the A horizon for nearly all the Mollisols with the exception of Tama and Muscatine where the content in the A and B horizons are nearly equal. Contents in the leached C horizons are lowest except for Joy. This is primarily caused by lower exchange capacity because the base saturation is very high. In general, the content of exchangeable calcium in the B horizons is intermediate between those of the A and C. The range of exchangeable calcium in the A from 9.3 in Tama, 13.4 in Muscatine, to 27.6 in Sable reflects principally the fact that the A horizons of Tama have less clay and organic matter than Muscatine or Sable, and this results in lower exchange capacity on which the calcium ions are held. The B and C horizons of the above-mentioned drainage sequence, Tama-Muscatine-Sable, have exchangeable calcium in the same order as the A horizons.

Exchangeable magnesium is lowest in the A horizon of the well-drained, moderately well-drained, and somewhat poorly drained soils as compared with the B and C horizon of these soils, and highest in the A, as compared with B and C in the poorly drained soils. Contents of exchangeable magnesium for all these Mollisols range from nearly 3 to 10 me./100 g. of soil.

The ratio of exchangeable calcium to exchangeable magnesium is usually lower as soil development increases. This is reflected in the A horizon of Joy, Muscatine, and Ipava soils, with Joy having an average ratio of 4.0, Muscatine 3.2 and Ipava 2.7.

The average exchangeable potassium content for all horizons of the Mollisols studied ranges from 0.24 to 0.45 me./100 g. of soil. It is highest in the A and B horizon and lowest in the C horizon.

Exchangeable sodium occurs in very small amounts ranging from 0.1 to 0.2 me./100 g. of soil. There is a slight tendency for the content to remain the same or increase slightly in the B and C horizons as compared with A horizons.

Available phosphorus. The P_1 test indicates the available phosphorus in pounds per acre. There is an apparent relationship between pH and available phosphorus. The soils or the horizons within soils with the lowest pH have the higher content of available phosphorus. Average values are shown in Table 8. P_1 values tend to be high in the A horizons, suggesting a cycling of phosphorus upward by plants. A relationship between drainage class and content of available phosphorus (P_1) is especially apparent in the B horizon, with the Tama being high, Muscatine intermediate, and Sable least. A possible explanation is that reduced iron-phosphate compounds are more soluble than oxidized iron-phosphate compounds and are moved lower in the profile of the more poorly drained soils.

Characteristics of the Alfisols Studied

Alfisol is a class name given to one of the ten orders (highest category) of the recently adopted National Soil Classification System in the United States developed under the leadership of the Soil Survey Staff, USDA (1960).

Alfisols can be described in very general terms as soils that have light-colored surface or A horizons or if dark they are less than 10 inches thick. They show evidence of clay accumulation in the B horizons and base saturation is normally greater than 35 percent throughout.

Most soils that are classified as Alfisols have formed under forest vegetation, which is responsible for their light-colored A or thin, dark-colored A_1 horizon. All of the Alfisols included in this study were sampled in areas that were forested at the time of sampling or had previously supported deciduous oak-hickory forest vegetation. Although Alfisols may develop in a wide variety of parent materials, the soils discussed here have developed entirely in Peorian loess.

Profiles numbered 1 through 18 inclusive (Table 1, page 2), are classed as Alfisols and they represent nine soil series (lowest category) as named in Table 1. The classification of these nine series through all categories of the new system is given in Table 16, page 57. The sampling sites of the 18 profiles are indicated by number in Figure 1. Field descriptions, exact sampling locations and analytical data are presented in the Appendix and are identified by profile number and series name.

In the classification system previously used, profiles 1 through 10 and 12 through 17 were classified as Gray-Brown Podzolic soils in the Great Soil Group category. Traer (No. 11) and Rushville (No. 18) were classified as Planosols.

Occurrence

As the areas occupied by Alfisols in northwestern Illinois are essentially areas that were forested, a general distribution pattern of all Alfisols, regardless of parent material, is clearly shown in Figure 8, page 33. They occupy mainly the white areas of the map or areas without a graphic art pattern and labeled "native forest" and portions of the lightly shaded areas labeled "mixed native prairie and forest." The Soil Association Map of Northwestern Illinois (attached inside back cover) delineates the same general areas with a fine black stippling. All numbers in the map legend followed by the letter B indicate general areas of Alfisols. Soils classed as Alfisols occupy a little more than 27 percent of the study area and those derived from deep loess account for approximately 22 percent.

Soil series in northwestern Illinois, which are Alfisols developed entirely in Peorian loess, are restricted generally to Soil Association Areas 1B, 2B, and 3B on the colored map. They occur in a fairly definite pattern adjacent to the major streams and their tributaries and generally occupy the more sloping landscapes. However, in areas where the Alfisols are most extensive they will occupy all landscape positions from the broad, nearly level interstream divides to the steepest slopes on the stream valley borders. Some deep loess-derived Alfisols occur in every county in the study area, but are most extensive in Jo Daviess, western Carroll, northern and western Whiteside, Rock Island, Mercer, Henderson, Knox, Peoria, and Tazewell counties.

Native Vegetation

The dominant native plant species under which Alfisols developed in this area are mixed oak and hickory. Soft and hard maple, elm, basswood, hackberry, black and choke cherry, black walnut and ash are of lesser importance. These latter species were probably the first to spread into the grassland dominated areas until gradually replaced by oak and hickory. Some areas are presently forested, especially the steep slopes along streams, but most of the original forest was cleared early in the nineteenth century as this portion of the state was being settled. Many cleared areas may have been under cultivation for more than a century.

Although not sampled and analyzed as part of this study, several soil series developed in loess and classified as Alfisols have thicker A1 horizons, if virgin, or darker Ap horizons, if cultivated, than typical. They are forest-prairie transition soils which are intergrading to Mollisols (page 32) and possess properties intermediate between Alfisols and Mollisols. They occur in areas where forest had recently encroached on prairie or areas covered with mixed grass and shrub vegetation with perhaps some scattered trees. These soils frequently occur as narrow bands along the forest-prairie borders.

Morphological Features

In the course of soil mapping in forested, deep loess areas, profile color variations were noted which were directly related to topography or natural drainage conditions. Variations in texture, particularly of the B horizons, were also noted. These B horizon texture differences could be related in a general way to distance from the primary loess source areas (Figure 5, page 13). Many soil series are established in Illinois and other states in forested, deep loess areas based on differences observable in the soil profiles.

Applying the knowledge gained from field mapping, laboratory analyses, interstate correlation, and special studies such as that of Muckenhirn et al. (1955), ranges in characteristics for the major series and their relationships to each other became fairly well established. Much research information and data are available for Fayette, one of the Alfisols included in this study, which occurs extensively in Minnesota, Iowa, and Wisconsin in addition to Illinois. Some of this information has been summarized by Klingelhoets (1959). Some relationships between the major deep loess Alfisols of northwestern Illinois which were studied are shown in Table 9.

The three separate oxidation or drainage sequences (toposequences) recognized differ in general profile development. These three "degrees of development," as they are commonly referred to, tend to be associated

Table 9. — Relationships Between Selected Loess-Derived Alfisols Occurring in Northwestern Illinois

Soil assn. area[a]	Loess characteristic[b]	Degree of profile development	Oxidation or natural drainage class			
			Well	Mod. well	Imperfect	Poor
1B	Recent, thickest, and coarsest	Weak	Seaton (1,2)[c]	Decorra[d]		
2B	Intermediate in age, thickness, texture	Moderate	Fayette (3,4,5,6)	Rozetta (7)	Stronghurst (8,9,10)	Traer (11)
3B	Oldest to intermediate, thinnest, finest	Moderate to moderately strong	Clary (12,13)	Clinton (14,15)	Keomah (16,17)	Rushville (18)

[a] Refers to areas on colored Soil Association Map.
[b] Characteristics to which the soils are generally related, but many exceptions can be found.
[c] Numbers identify the specific profiles included in this study (Appendix).
[d] No profiles sampled, soil series not extensive.

with differences in parent loess characteristics such as thickness, particle size distribution, and age.

The detailed profile descriptions (Appendix) show that the Alfisols of this study have some morphological characteristics which are similar for all profiles. Under forest vegetation all developed a thin, dark **A1 horizon** which is the zone of maximum organic-matter accumulation (Figure 15). This dark A1 surface ranges from two to six inches thick in virgin areas, but includes some Ap horizons or plowed layers in this study. All Munsell hues were recorded as 10YR and the dominant color value is 3, but ranging from 2 to 4. With one exception, chromas are 1 or 2, and the 1 chromas are more common in the more poorly drained profiles. Thus, the dominant colors are very dark gray, dark gray, very dark grayish brown or dark grayish brown. In cultivated areas, the plow layer (Ap) colors of some of these soils approach or meet the requirements for mollic intergrades in the new classification (Table 16, page 57), even though at time of sampling they were considered to represent soils developed under deciduous forest. All A1 or Ap horizons are silt loams with friable to very friable consistence. Crumb is the dominant structure type, with the remainder being described as granular. Structure grade is weak to moderate.

All profiles have **A2 horizons** ranging in thickness from 3 to 10 inches, averaging about 6 inches. Colors are dominantly of 10YR hue, with values of 4 or 5, chromas of 2, 3, or 4, and range from dark grayish brown to yellowish brown. The yellowish-brown colors are associated with the well-drained series. The poorly drained Rushville has a chroma of 1 (i.e., light gray to gray). The grayest A2 colors are commonly associated with the most poorly drained profiles. The A2 horizon in these soils represents a zone of maximum removal or eluviation of organic matter, clay, iron, and other materials resulting in a concentration of quartz and other resistant minerals, primarily of silt size. The presence of an A2 horizon in these soils is in sharp contrast to the morphology of the Mollisols (page 32) which have thick, dark A1 horizons and no A2 horizons. The A2 horizons are all silt loam in texture and have friable or very friable consistence. Structure is dominantly weak to moderate, very thin, thin, or medium platy. Crumb or granular structure may occasionally occur.

Although all Alfisol profiles described and sampled for this study have A2 horizons, this horizon will not always be distinguishable. In cultivated areas, and especially where erosion has occurred, the A2 horizon may be incorporated entirely in a plow layer (Ap) or eroded away. The obliteration of the A2 horizon is most common in the well-drained and moderately well-drained soils, such as Seaton, Fayette, Rozetta, Clary, and Clinton, which occupy more sloping landscape positions than do the other soils studied.

Descriptions of the Alfisols (Appendix) indicate that these soils have transitional horizons between the A2 and B2 which are designated as **A3, B1, or AB horizons.** Total thickness of these transitional horizons ranges from 2 to 12 inches, averaging about 5 to 6 inches. They range in texture from silt loam to silty clay loam, and in structure from granular to blocky. Colors vary with the natural internal drainage. They are usually dark brown to yellowish brown in the well- and moderately well-drained soils and grayish in the imperfectly to poorly drained soils. The poorly drained soils Traer and Rushville have grayish-brown (2.5Y 5/2) and gray (10YR 5/1) colors respectively in these transitional horizons. In all profiles these horizons have a speckled pattern of aggregate coatings that are distinct when dry, but tend to disappear when moist. The coatings appear to be bleached individual silt grains or small aggregates that are gray, light gray, light brownish gray, or occasionally white in color. These coatings usually occur also on many aggregates in the B2 horizons below.

That portion of the solum already discussed for all Alfisols of this study indicates many similarities. However, it has been pointed out that lower chromas or grayer colors are associated with the more poorly drained soils, especially the somewhat poorly and poorly drained series (see Table 9). Morphology of the lower sola can best be discussed if the Alfisols are grouped according to drainage characteristics or features associated with wetness. This is the main characteristic used in establishing subdivisions (suborders) of the Alfisol order (see page 59). The well- and moderately well-drained Alfisols are placed in the Udalf suborder and the somewhat poorly and poorly drained Alfisols in the Aqualf suborder (see Table 16, page 57). The Udalf and Aqualf suborders are discussed on pages 59 to 60.

The **B2 horizons** are very important in these soils and show distinct differences between suborders and between series. The B2 horizons are illuvial horizons which contain the most clay and usually exhibit the strongest structure in the entire profile (Table 10).

The B2 horizons of the Udalfs (Seaton, Fayette, Rozetta, Clary, and Clinton) range in thickness from 13 to 27 inches. The main colors are 10YR 4/3, 4/4, 5/3, 5/4, or 5/5, which are dark brown, brown, dark yellowish brown, and yellowish brown. These colors are indicative of good natural drainage and aeration. No mottles are present in the B2 horizon of the well-drained Seaton, Fayette, and Clary soils. The moderately well-drained Rozetta and Clinton soils have mottlings or mixed colors in the lower B2 horizons, which are also accompanied by iron-manganese concretions. Grayish silt coatings are described in the B2 horizons of all the Udalfs except Fayette (No. 3 and 5), although in some profiles these coatings occur only in the upper portion of the B2 horizons.

Clay films or coatings are described in B2 horizons of all the Udalfs, indicating translocation of clay. Although present in the Seaton profiles, films or coatings are thin and patchy in occurrence. In the other Udalfs the clay coatings vary from thin to thick and discontinuous to continuous. These clay coatings are normally darker in color than the soil matrix and are frequently of 7.5YR hue. Structure is most frequently moderate, fine or medium, subangular blocky, but is occasionally described as strong except in Seaton profiles. Angular blocky structure may occur as well as weak or moderate prismatic which breaks to subangular or angular blocky structure. Consistence and texture in Seaton is friable to firm silt loam and in the other Udalfs is normally firm silty clay loam.

The B2 horizons of the Aqualfs (Stronghurst, Traer, Keomah, and Rushville) range in thickness from 14 to 28 inches. These soils are wetter than the Udalfs and have lower chromas and more yellow hues. The somewhat poorly drained Stronghurst and Keomah soils characteristically have brown (10YR 5/3) colors in the upper B2 horizons often with some mixing of grayish brown (10YR 5/2). The lower B2 horizons are usually grayish brown or light brownish gray with brown and yellow-brown mottles or are described as having a mixed color pattern of grayish brown or brownish gray and yellowish brown. Hues are normally 10YR or 2.5Y.

The poorly drained Traer and Rushville have gray to olive gray colors mixed with grayish brown and mottles of yellowish brown to strong brown. Chroma are commonly 1 in hues of 10YR, 2.5Y, or 5Y. Few to numerous iron-manganese concretions occur in both the somewhat poorly (Stronghurst and Keomah) and poorly drained (Traer and Rushville) soils.

Clay coatings occur in the B2 horizons of these soils, presenting evidence of clay movement in the profile. These coatings vary in thickness and occur in continuous and discontinuous patterns, but occur most frequently on vertical ped faces. They are usually of lower chroma and value than the matrix material and appear to contain incorporated organic matter. Grayish silt coatings also occur in the Aqualfs, but are not as distinct as in the Udalfs because of a tendency for the Aqualf profiles to be more moist when observed. Structure in the B2 horizons is usually moderate subangular blocky in the upper portion and weak to moderate prismatic in the lower portion which breaks to subangular or angular blocky. Consistence is described as firm in all B2 horizons of Aqualf profiles. Silty clay loam textures dominate and the Rushville and one Keomah profile (No. 16) have light silty clay textures in a portion of the B2 horizon.

The Alfisol descriptions (Appendix) indicate the presence of a transitional horizon between B2 and C, which is designated B3 in all profiles except Stronghurst (No. 9) and Traer (No. 11). However, the descriptions, and clay content data (Fig. 13) for the designated C1 horizons of Stronghurst (No. 9) and Traer (No. 11) respectively, indicate a transitional zone in these profiles which might qualify perhaps better as B3 rather than C1 horizons. In general, the B3 horizons and any subdivisions described have properties which indicate this portion of the profile in undergoing changes as the result of soil-forming processes. Carbonates and other soluble materials have been removed from the loess parent material, structure has developed, and some clay coatings occur which indicate movement of materials into the horizon from above.

The **B3 horizons** of the Udalfs (Seaton, Fayette, Rozetta, Clary, and Clinton) range in thickness from 7 to 36 inches. The B3 horizons in Seaton are thicker than in the other soils, being 27 inches in No. 1 and 36 inches in No. 2, respectively. This may be caused, in part, by alterations such as clay illuviation to greater depths because of the coarser texture and larger individual pores associated with the parent loess material near to its source area. Both Seaton profiles occur in thick, coarse-textured loess very near a source area (Figs. 1 and 5). The B3 horizon of the well-drained soils (Seaton, Fayette, and Clary) have dominant colors of 10YR 4/3, 4/4, 5/3, 5/4, or 5/5 which are dark brown, brown, dark yellowish brown, or yellowish brown. They are relatively free of mottling, but some iron-manganese concretions are noted in both Clary profiles (No. 12 and 13) and one Fayette profile (No. 6). The B3 horizon of those Udalfs which are considered moderately well drained (Rozetta and Clinton) have either mixed colors including chromas of 2 or less or are brown or yellowish brown with mottles having chromas of 2 or less. They also contain iron-manganese concretions. Grayish silt coatings are described in the B3 horizons for about one-half of these profiles.

Clay films or clay coatings are described in all B3 horizons of the Udalfs except for one Seaton (No. 1) profile. In contrast to the B2 horizon, the films are always patchy or discontinuous and normally described as thin. Color is similar to clay coatings in B2 horizons. In general, structure in B3 horizons is weaker than in the overlying B2 horizons. In the 11 profiles (five series) classified as Udalfs, structure is dominantly described as weak and includes prismatic, subangular blocky and angular blocky types. Angular blocky structure is described more frequently than in the B2 horizons. In the B3 horizons consistence normally ranges from friable to firm and texture ranges from heavy silt loam to light silty clay loam. The lower clay content and tendency toward more friable consistence is in contrast to the overlying B2 horizon.

The B3 horizons of the Aqualfs (Stronghurst, Keomah, Traer, Rushville) range in thickness from 6 to 18 inches. The somewhat poorly or poorly drained characteristics of these soils is reflected in the colors of their B3 horizons. Colors are grayer and mottles more distinct than in the B3 horizons of the Udalfs and concretions occur in greater quantities. Dark, thin, patchy clay films of 2 or 1 chroma are described in most profiles, but the grayish silt coatings, common in the overlying B2 horizons of these soils, is lacking. Consistence is described as firm or friable and texture as light silty clay loam or occasionally silt loam. Structure is normally weak, but occasionally moderate and the type is dominated by angular blocky and prismatic.

The solum is normally considered that portion of the profile which has been altered by soil-forming processes and is usually considered as the total thickness of A plus B horizons. In these deep loess soils the selection of the depth at which alterations in the parent material are absent or insignificant is not always clear cut. Therefore, some solum depths are somewhat arbitrary.

The morphological descriptions (Appendix) show the solum thicknesses of the Udalfs (well and moderately well drained) to range from 46 to 70 inches with an average of about 55 inches. The same data for the Aqualfs (somewhat poorly and poorly drained) is a range from 35 to 56 inches with an average of about 44 inches. This relationship of thicker sola in the better drained soils has two exceptions. Stronghurst (No. 10) and Rushville (No. 18) overlap with the better drained soils. Excluding these two soils from the other Aqualfs, gives a solum thickness average of about 40 inches.

With only one exception (Keomah — No. 17), C horizons begin before calcareous loess is encountered. Depth to calcareous loess was measured in all profiles where possible. In three cases the loess section was completely leached of carbonates (Stronghurst — No. 8; Clary — No. 12; and Rushville — No. 18).

The non-calcareous **C horizons** of the Udalfs are dominantly brown or yellowish brown, although grayish colors are present in some profiles, especially the moderately well-drained Rozetta and Clinton. Iron-manganese concretions usually accompany the grayer colors. Textures are mostly friable silt loams and structure is massive or occasionally weak, coarse blocky. Clay films are usually absent, but are occasionally described, as are some root channels lined with thin clay coatings. In contrast to the Udalfs, the non-calcareous C horizons of the Aqualfs (more poorly drained soils) have more brownish gray and grayish-brown colors in more definitely mottled patterns, accompanied by more numerous iron-manganese concretions.

Calcareous C horizons were not completely described in all profiles where they occurred. In both Udalfs and Aqualfs colors tend to be mixed browns and grays with more dominantly grays in the Aqualfs. Iron-manganese concretions are common except in the Seaton and Fayette profiles. Friable consistence, silt loam texture, and a structureless, massive condition characterize this relatively unaltered parent material in the calcareous C horizon. Calcareous loess is more completely characterized in the section beginning on page 16.

Physical Properties

Particle size distribution. The content of sand, silt, and clay and their changes with depth are extremely important in these soils. It determines or affects many of the other soil properties and is an important consideration in soil classification.

Because loess parent material is low in sand content, only small amounts of greater than 0.05 mm. material occur in these soils. In general, the sand fraction makes up less than 5 percent of the total mineral component in most profiles. The notable exceptions of the Alfisols studied are Seaton (No. 1) and Fayette (No. 3) located in Carroll County. The presumed Mississippi River source in this area contributed more sand to the loess than is indicated in other areas. Seaton (No. 1), which was sampled within about one mile of the river bluff, contains from 10.7 to 22.1 percent sand in the upper 5½ feet of the profile and increases markedly below this depth. Fayette (No. 3), located almost directly east of the Seaton (No. 1) profile, approximately 8 miles from the river bluff, contains 6.5 to 11 percent sand in the upper 5½ feet of the profile.

Considerable variation in clay content occurs among these soils. In the previous discussion on morphology, the illuviation of clay and presence of clay films was mentioned. These soils all have argillic horizons which, by definition, require among other things a 20-percent increase in clay content over the surface horizons and evidence of clay translocation. The argillic horizons

Table 10. — Selected Characteristics of B2 Horizons of Alfisols Studied[a]

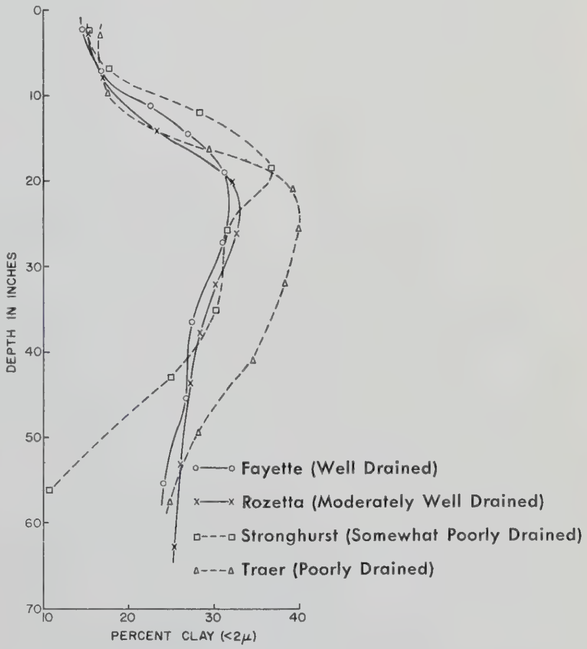
Series and profile no.	Total thickness (inches)	Depth to middle of horizon of max. clay accum. (inches)	Max. <2u clay (%)	% clay in B[b] / % clay in A	% coarse silt / % fine silt	Ca/Mg ratio	Base sat. (%)
			Soils with weak development				
Seaton (1)	15	23	22.7	2.2	2.4	2.6	77
Seaton (2)	13	26	22.1	1.9	2.5	2.2	75
Average	14	25	22.4	2.1	2.5	2.4	76
			Soils with moderate development				
Fayette (3)	26	27	29.4	2.5	1.5	1.9	63
Fayette (4)	20	21	34.6	2.3	1.0	1.2	78
Fayette (5)	21	27	30.3	2.6	1.3	2.4	77
Fayette (6)	16	19	31.7	2.1	1.2	2.3	95
Average	21	24	31.5	2.4	1.3	2.0	78
Rozetta (7)	23	26	32.8	2.1	1.1	1.7	93
Stronghurst (8)	14	21	32.8	2.4	1.0	1.5	76
Stronghurst (9)	26	18	37.0	2.5	1.1	1.7	99
Stronghurst (10)	23	30	36.1	2.4	1.1	1.3	86
Average	21	23	35.3	2.4	1.1	1.5	87
Traer (11)	28	26	39.8	2.4	.9	1.6	100
			Soils with moderately strong development				
Clary (12)	26	22	36.9	2.5	.6	1.4	88
Clary (13)	27	21	36.6	2.4	.9	1.3	81
Average	27	22	36.8	2.5	.8	1.4	85
Clinton (14)	24	18	36.4	2.8	.8	1.2	67
Clinton (15)	15	22	36.4	2.1	...	1.7	71
Average	20	20	36.4	2.5	.8	1.5	69
Keomah (16)	18	19	41.1	2.9	.7	1.4	97
Keomah (17)	19	24	39.2	3.0	.6	.6	77
Average	19	22	40.2	3.0	.7	1.0	87
Rushville (18)	20	20	40.3	3.4	.8	1.7	70

[a] Weighted according to thickness of B_2 subhorizons.
[b] Ratio of maximum clay in B_2 to minimum clay in A.

are those containing the higher clay contents and usually, but not entirely, corresponding with the B2 horizon and its subdivisions.

The degree of expression of the argillic horizons and profile development allow general groupings of these soils as indicated in Table 10. The Seaton (and Decorra) soils of Area 1B on the Soil Association Map have weakly expressed argillic horizons and maximum clay contents (Table 10) not exceeding 27 percent and ranging from about 18 to 27 percent. These soils have silt loam textures throughout their profiles. They occur associated with the deep, coarser loess deposits near the Mississippi River source area.

The Fayette, Rozetta, Stronghurst, and Traer soils form a toposequence representing moderately developed soils occurring in 2B areas on the Soil Association Map. They possess more strongly developed argillic horizons and show more evidence of clay illuviation than the Seaton and Decorra soils. Figure 13 shows the clay distribution with depth of representative profiles of this toposequence occurring as landscape associates at the sampling site in La Salle County. The Fayette (No. 6) and Rozetta (No. 7) soils show a very



Distribution of clay in an Alfisol toposequence of moderately developed soils. (Fig. 13) similar clay distribution pattern. The somewhat poorly drained Stronghurst (No. 9) has more clay in the B2 horizon (maximum of 37 percent) and the poorly drained Traer (No. 11) has fine silty clay loam textures throughout the B2 horizon (approximately 20 to 40 inches depth) with a maximum clay content of 39.8 percent.

The Traer and Stronghurst soils are wet for longer periods of time than the Rozetta and Fayette soils and this encourages the weathering processes of hydration and hydrolysis. In addition, a fluctuating water table and greater total amount of water passing through the soil profile because of topographic position favors increased clay movement and concentration within the profile. Normally it could be assumed the clay content of the original parent loess of these soils was quite uniform. Particle size distribution data from relatively unaltered loess containing significant carbonates is available only from the Stronghurst profile. If the loess at this site containing the four members of the toposequence was uniform, the additional clay accumulation in the Traer (No. 11) profile could not be explained on the basis of clay translocation alone, but implies considerable clay formation in its wetter environment.

Table 10, page 45, shows the maximum content of $<2\mu$ clay in the four Fayette profiles included in this study. All profiles have silty clay loam B2 horizons. The extensively occurring Fayette soils have clay contents in the B horizon ranging from 27 to 35 percent. This same clay range is typical of Rozetta soils. Stronghurst soils will probably average slightly higher in clay maximum values. Traer soils have the strongest development of the soils in this sequence and because of their high clay content are classed as fine textured in the family category of the classification system.

The soils occurring generally in 3B areas on the Soil Association Map also form a drainage or toposequence. These soils are normally considered to have moderately strong profile development and occur in areas where the loess deposits are thinner or more finely textured, or both. The soils in this sequence, including Clary, Clinton, Keomah, and Rushville, have well-developed argillic horizons with clay maximum in B2 horizons exceeding 35 percent. These soil series are presently all classed as fine textured in the family category of the classification system (Table 16, page 57). Clary (No. 13) and Clinton (No. 14) of this study, however, qualify for the fine silty rather than the fine family. The range in clay content of the B2 horizon is normally 35 to 42 percent.

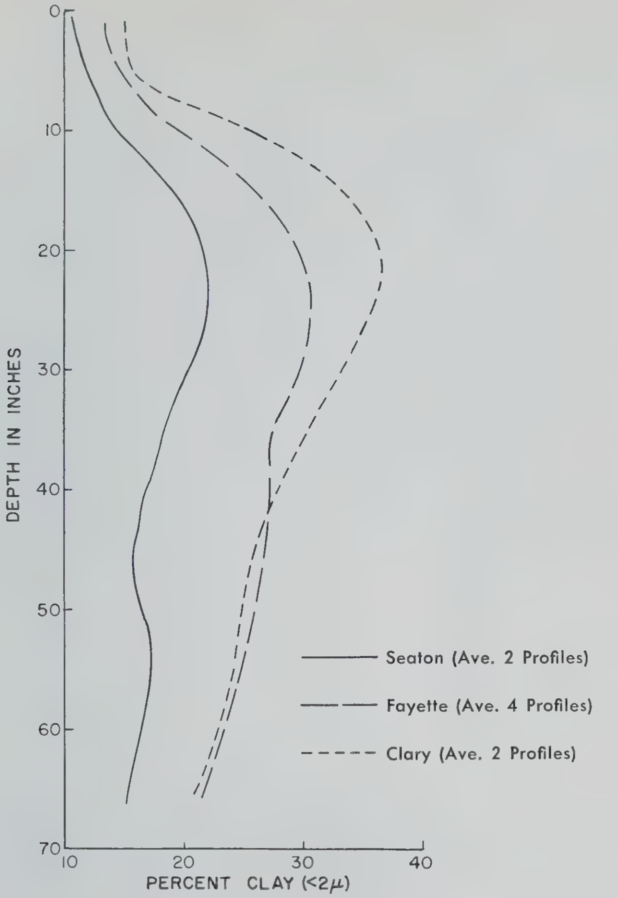
The distribution of 3B areas on the Soil Association Map is restricted to the southern one-half of the study area. The classical distribution pattern of the different stages of development in loess soils is best illustrated in the southwestern portion of the Association Map in an easterly direction from Henderson County to Knox County. Considering the forested soils (letter B), the Seaton and associated soils, area 1B, occur in a narrow band just to the leeward side of the Mississippi River source area. Fayette and associated soils, area 2B, occur throughout a wider belt to the east, and Clinton and associated soils, area 3B, occur in eastern and southern Warren County and eastward through Knox County. The soil pattern follows closely, but not exactly, the loess thickness pattern (Fig. 5, page 13) in this region. Soils possessing the morphology and properties of those in area 3B are not known to occur to any great extent north or east of the Green River basin or immediately adjacent to the basin on the south. Loess thinning patterns (Fig. 5, page 13) do exist in these areas, but only the Seaton and Fayette stages of development are represented by the soils. Thinner glacial drift or absence of drift below the loess, bedrock-controlled topography, and greater percentage of well-drained upland soils are characteristics of the areas north of Green River basin. These characteristics contrast with 3B areas in the southern half of the study area which have comparable loess thickness. It has been suggested by Fehrenbacher et al. (1968) that clay accumulation in B horizons appears to have maximum expression in forested, loess soils in a zone through west-central Illinois which includes many 3B areas in the southern portion of this study area. It is suggested that clay formation to the north of this area has been less because of slightly lower rainfall and temperature which probably has prevailed since loess deposition and during soil profile development of these soils (Tables 2 and 3).

Table 10, page 45, lists the maximum clay content in the B2 horizons and the ratio of maximum clay in B2 horizons to minimum clay in A horizons for all the Alfisols studied. The ratio of coarse silt to fine silt in B2 horizons, also shown in Table 10, indicates that profiles with the greatest clay contents also tend to contain more fine silt than coarse silt. This relationship was shown by Muckenhirn et al. (1955) in several forested loessial soils in the Mississippi Valley.

Figure 14 shows average clay content with depth for Seaton (No. 1 and 2), Fayette (No. 3, 4, 5, and 6), and Clary (No. 11 and 12) to show the contrast existing between well-drained soils of the three "degrees of development" recognized in classifying and mapping these soils.

Bulk density, porosity, and hydraulic conductivity values were obtained from selected horizons of eight of the Alfisols of this study. These are profile No. 6, 7, 8, 9, 11, 13, 16, and 17 representing Fayette, Rozetta, Stronghurst, and Traer profiles from the moderately developed sequence and Clary and Keomah profiles from the moderately strongly developed sequence of soils. Drainage and stage of development differences seem to have little effect on these properties, except perhaps hydraulic conductivity.

Bulk density values are lowest in A1 horizons and tend to increase with depth, averaging highest in C horizons. Increases below the B2 horizons are small.



Average distribution of clay in well-drained Alfisols representing three development stages. (Fig. 14)

Four A1 horizons range from 1.22 to 1.33, with an average of 1.28; eight A2 horizons range from 1.32 to 1.50, with an average of 1.39; ten B2 horizons range from 1.36 to 1.52 with an average of 1.45; four B3 horizons range from 1.43 to 1.53, with an average of 1.47; and seven C horizons range from 1.41 to 1.58, with an average of 1.49. Four of the seven C horizon samples were taken in calcareous loess and the lowest (1.41) and highest (1.58) values were calcareous samples.

Total porosity shows little relationship between soils. Values range from 40.0 percent in the A2 of Keomah (No. 17) to 51.4 percent in the B2 of Stronghurst (No. 8). Values were determined on only four A1 horizons and three of these had the highest porosity in their respective profile. Porosity was determined on A2 horizons of all eight profiles and in four cases they had the lowest porosity. In three other profiles, A2 porosity was next to lowest. The reduction of total porosity of A2 horizons is the result of reduction in capillary porosity (percent pore space not drained by 60 cm. tension) rather than noncapillary porosity. Noncapillary porosity ranges from 2.0 percent in the B2 of Keomah (No. 17) to 9.9 percent in the B2 of Stronghurst (No. 8). Lowest noncapillary percentages occur in B2 horizons or lower in the profile.

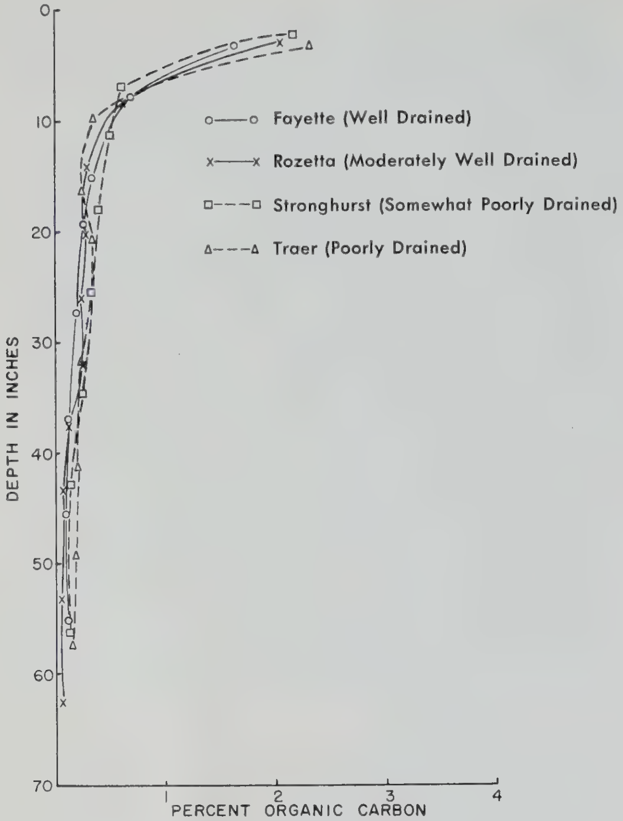
Hydraulic conductivity values are low in C and B3 horizons where structure is lacking or weak. In all eight profiles, slowest conductivity occurred in B2, B3, or C horizons. The data indicate some tendency for conductivity to be slowest in the Keomah soils (No. 16 and 17) and Traer (No. 11) which have thicker, more finely textured B2 horizons than the other five profiles.

Water retention values. Water retained at ⅓-atmosphere and 15-atmosphere tension was determined on Fayette (No. 4 and 6), Rozetta (No. 7), Stronghurst (No. 8 and 9), Traer (No. 11), Clary (No. 12 and 13), and Keomah (No. 16 and 17). Available moisture was considered as moisture capable of being held between these two tension values. Where not available, assumed bulk density values ranging from 1.3 for surface horizons to 1.5 for C horizons were used to determine estimated inches of available water capable of being held to a depth of 60 inches. These calculated values are very similar for all profiles, averaging nearly 18 inches of available water to this depth. On the basis of these data, the Alfisols included in this study could be expected to have the capacity to hold somewhere between 15 to 19 inches of available water to a five-foot depth.

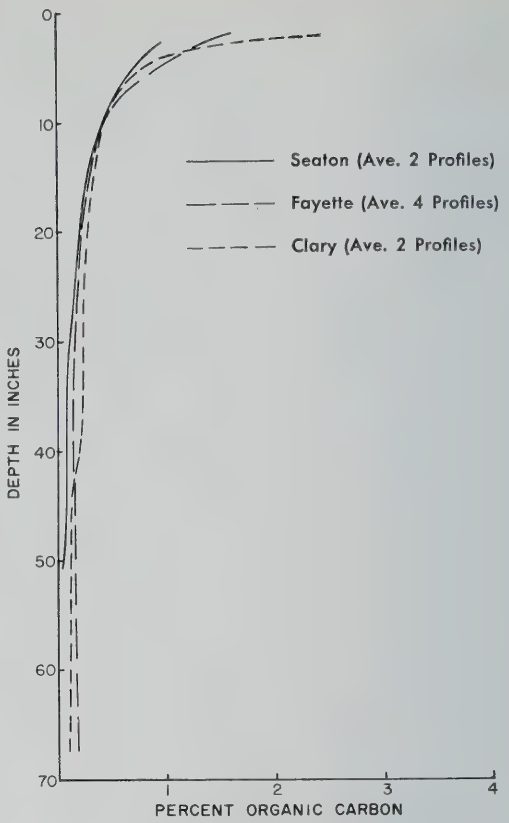
Chemical Properties

Organic carbon content distribution with depth exhibits a general pattern for all Alfisol profiles sampled. Maximum content occurs in A1 or Ap horizons with a sharp decrease to less than 1 percent organic carbon in A2 horizons. This reduction occurs at depths of less than 10 inches and then a gradual decrease occurs with depths in the profile. The range in organic carbon in A1 and Ap horizons is 0.87 percent in Seaton (No. 1) and Fayette (No. 3) to 4.24 percent in Stronghurst (No. 8). The latter was sampled in a bluegrass roadbank and has a much higher carbon content in the surface horizon than would be expected under cultivation. Although there is some overlap in the data, a general relationship exists between color and organic carbon content of surface horizons and the drainage class or moisture relationships of the soils in this study. Poorly and somewhat poorly drained soils normally have more darkly colored A1 or Ap horizons with higher organic carbon content than their moderately well- or well-drained landscape associates. The toposequence of Fayette (No. 6), Rozetta (No. 7), Stronghurst (No. 9), and Traer (No. 11), which occur as close associates in the same landscape in La Salle County, illustrates this normal relationship, although differences in organic carbon content are small (Fig. 15). The comparison of average organic carbon distribution curves for Seaton, Fayette, and Clary are given in Fig. 16. These soils represent the well-drained series of the three development stages.

pH and base saturation. Hydrogen ion concentration expressed as pH values indicates much greater acidity in the Alfisols than the Mollisols of this study.



Distribution of organic carbon in an Alfisol toposequence of moderately developed soils. (Fig. 15)



Average distribution of organic carbon in well-drained Alfisols representing three development stages. (Fig. 16)

Lowest pH values in the Seaton profiles, Fayette (No. 6), and Keomah (No. 16) fall in the strongly acid range, while all other profiles have horizons that are very strongly acid. Clinton (No. 14) and Keomah (No. 17) have horizons with pH values below 4.5 which are extremely acid. Most of the Alfisols have surface horizon pH values that reflect additions of agricultural lime or road lime dust to the soil surface. Greatest acidity normally occurs in B horizons where lowest pH values most commonly range between 4.5 and 5.0. Four profiles had lowest pH values in A2 horizons. Highest pH values occur in the C horizons; the few exceptions were in profiles that were not sampled much deeper than depth of the solum. Rushville (No. 18) remained acid to greater depths than the other soils and had a pH value of 6.0 at 132 inches. The typical level to depressional nature of the Rushville site favors accumulation of runoff from adjacent areas and the movement of large amounts of water through the soil. Leaching of carbonates and development of acidity to considerable depths can be enhanced under these conditions.

Percent base saturation of all profiles is well above the minimum requirement defined for the Alfisol order in the National Soil Classification System developed by the Soil Survey Staff, USDA (1960). Lowest values occur in the A2 horizons of Stronghurst (No. 8 and 10) and in the A1 and A2 horizons of Clinton (No. 14), which are all below 30 percent. In all profiles, some portion of the B horizons have base saturation values of 75 percent or higher. No distinct differences in pH values or percent base saturation occur that can be clearly related to the degree of development of these soils.

Cation exchange capacities vary primarily with the organic matter and clay content of the soil profile. In these soils, the A1 or plow layers usually have fairly high values because of organic matter accumulation in these horizons. Surface horizons range from a low of 9.6 me./100 g. in Seaton (No. 1) to 23.5 me./100 g. in Stronghurst (No. 8), with an average for all profiles of 14.2. Stronghurst (No. 8) has an unusually high organic matter content, probably caused by sampling in a bluegrass sod roadbank. A2 horizons or A3 horizons, as in the case of the Seaton profiles, usually have the lowest values because of their low combined organic and mineral colloidal content. Maximum values in all but one profile occur in some subdivision of the B2 horizon, usually that subhorizon with the maximum clay content.

The maximum exchange capacities of the Seaton profiles are low: 16.8 me./100 g. for profile No. 1

and 14.5 me./100 g. for profile No. 2. These low values are related to the lower clay contents in these profiles in comparison with the more strongly developed soils. Maximum values ranging from 26.0 to 28.8 me./100 g. occur in the B2 horizons of all Stronghurst, Traer, Clinton, Keomah, and Rushville profiles. Average cation exchange capacities for B2 horizons of all the Alfisols except Traer (No. 11) and Rushville (No. 18) are indicated in Table 12, page 53. Discussion of this table, indicates the trend of increasing exchange capacities with increasing development in well- and moderately well-drained Alfisols. Also, as drainage class becomes poorer, exchange capacities tend to increase. It is suggested the increased clay content in both situations is primarily responsible for these trends.

Exchangeable cations. The exchangeable amounts of individual bases, where determined, are shown in the Appendix. Calcium is the dominant exchangeable cation in all profiles except for Keomah (No. 17), where exchangeable magnesium is dominant below the A2 horizon. This may be caused by an original parent material difference in the Keomah sampling area rather than an indication of more intense weathering of the profile. Exchangeable potassium occurs in generous amounts in most profiles. Sodium occurs in small amounts and in a few profiles shows increases with depth. The ratio of exchangeable calcium to magnesium has been used as an indicator of profile development and weathering by Muckenhirn et al. (1955). Table 13, page 53, shows the average ratios for major horizons of the three catenas of Alfisols in this study. It is pointed out on page 52 that the calcium-magnesium ratios narrow, going progressively from the weakly developed Seaton catena to the most strongly developed Clary catena. The averages also indicate a narrowing of the ratio in all catenas with depth through the B3 horizons, and even into C1 horizons in the Seaton and Fayette catenas. The calcium-magnesium ratio in B2 horizons for each individual Alfisol profile is given in Table 10, page 45.

Available phosphorus. Phosphorus tests (P_1 and P_2) according to the methods described by Laverty (1963) were made on all horizons of 12 of the Alfisol profiles sampled. No test results are reported for Seaton or Clinton profiles. The P_1 test measures readily available or adsorbed phosphorus and the P_2 test measures both available and reserve phosphorus. These soils are all located in the portion of Illinois considered to have a high inherent phosphorus-supplying power below the plow layer according to Aldrich et al. (1970). P_1 test values average relatively high and subsoil characteristics favor good root penetration and branching in this area.

Values for the P_1 test have a relationship with pH values in most profiles because horizons with lower pH values (more acid) tend to have the highest P_1 values. Trends in most profiles are low P_1 test values in surface horizons, high values in the B horizons, and lower values again in C horizons. P_2 values follow a similar pattern, but tend to remain high in C horizons. P_1 and P_2 values are relatively high, but the profiles sampled east of the Illinois River, Clary (No. 12 and 13) and especially Keomah (No. 16 and 17), have lower values than the other soils. The Keomah profiles (No. 16 and 17) have shallow sola and both have calcareous loess at 41 inches. The shallow depth of leaching significantly affects available and reserve phosphorus in these profiles. While P_1 and P_2 values are low in relation to the more deeply leached profiles, both show a high P_2 value just above the calcareous loess. In the La Salle County toposequence (Fayette No. 6, Rozetta No. 7, Stronghurst No. 9, Traer No. 11), Stronghurst has lower P_1 values than the associated soils. Stronghurst has the thinnest solum with calcareous loess at 46 inches. Depth of carbonate leaching is 69 to 100 inches in the other three soils in the toposequence which have higher P_1 values. Depth of carbonate leaching in the loess parent material appears to have more affect on phosphorus availability than the natural drainage class of the soil or the pH values in the solum.

Water Table Studies

Water table studies were conducted from 1961 to 1965 in the toposequence of Alfisols, including Fayette, Rozetta, Stronghurst, and Traer in La Salle County (Fehrenbacher et al., 1969). Water tables were near the surface in the poorly drained Traer and somewhat poorly drained Stronghurst during the late winter and early spring seasons when rainfall was nearly normal or above normal. During these same periods it was as high as 45 to 50 inches below the surface for a short time in moderately well-drained Rozetta. The water table was never above 84 inches depth in the well-drained Fayette during the study. In the very dry year of 1963, the water table was below 60 inches depth in all of these soils. The site on which the water table studies were made was in bluegrass pasture with scattered trees throughout the study period.

Genesis and Development of Deep Loess Soils

The widespread occurrence of Peorian loess in northwestern Illinois, its relatively uniform texture, and its gradual thinning from the Mississippi and Illinois River floodplains, indicate wind as the final transporting agent. Its source was primarily the silty sediments deposited in the major floodplains from melt-waters of Woodfordian glaciers. Some of the sand may have had a more local source, as mentioned on page 14. Some of the montmorillonitic clay may have had a more distant source according to Beavers (1957), although Frye et al. (1962) concluded that "both the clay and coarser fractions of the loess were derived locally from the sediment transported through the source valleys."

The soils included in this study have weathered about 8,000 to 10,000 years or slightly longer according to radiocarbon dating and carbonate leaching measurements or about 18,000-20,000 years according to estimates based on varve counts and other geological evidence. Both are very short periods in the geological time scale and these soils must all be considered youthful.

Regardless of the actual number of years that have passed, the Ipava-Clinton group of soils (Areas No. 3 on the colored Soil Association Map) have more strongly expressed horizons than the Muscatine-Fayette soils (Association Areas 2), which in turn have more strongly expressed horizons than the Port Byron-Seaton soils (Association Areas 1). Other less developed soils than Port Byron and Seaton, soils without B horizons and with extremely abbreviated sola (e.g. Hamburg, Tallula, Hopper), are present but usually occur on steep slopes where erosion tended to keep pace with soil development. Furthermore, each deep loess soil type found in northwestern Illinois has profile characteristics that distinguish it from all other deep loess types. These distinguishing features are caused primarily by variations in the parent loess, by length of effective weathering time, by differences in drainage or aeration, and by differences in native vegetation.

Parent Material

The sola of all soils studied were formed in Peorian loess more than five feet thick. As judged by the relatively unweathered portion of the C horizon (i.e., the calcareous material), Peorian loess was high in silt when deposited, ranging for the most part between 75 and 85 percent by weight. It was relatively low in clay, ranging primarily between about 12 and 20 percent, and very low in sand with less than 5 percent except in some areas on or adjacent to the bluffs. The sand is mostly fine to very fine (0.25-0.05 mm.) and in many samples consists of 2 percent or more secondary iron oxide concretions. Material of gravel size (greater than 2.0 mm.) is rare, but when present consists of either secondary concretions formed in the loess through weathering or small pebbles that were incorporated by burrowing rodents or Crustacea or by frost action.

In the past, loess has been considered a uniform material particularly as a soil parent material. Compared with glacial till and water-deposited sediments it is relatively uniform, but when examined in detail important variations are found (see pages 16 to 19).

Under intermediate internal drainage (i.e., moderately poor to moderately well-drained) strata of calcareous Peorian loess with 5Y 4/1-5/1, 2.5Y 5/2-6/2, and 10YR 5/4-5/6 colors, as well as iron concretion bands and concretions of 7.5YR 5/6-5/8, all appear in the same vertical section (see description of soil No. 29 in Appendix). In areas of poor drainage with a high water table, colors are primarily gray, but usually include mottles of brown or yellowish brown and, in well-drained sections with a deep water table, the colors are mostly yellowish brown, but sometimes include grayish mottles or faded remnants of grayish strata.

Total sand, total silt, and total clay do not appear to differ significantly in the calcareous portion of any one vertical section of thick Peorian loess, but the ratio of coarse silt (0.05-0.02 mm.) to fine silt (0.02-0.002 mm.) and coarse clay (0.002-0.0002 mm.) to fine clay ($<$0.0002 mm.) may change from greater than 1 to less than 1 and vice versa. Also, certain chemical and mineralogical properties vary. The significance of these physical, chemical, and mineralogical variations is not well understood, but they may be caused primarily by differences in the original source material.

Leverett (1899) noted that loess on the river bluffs near the source was more coarsely textured and more porous than at some distance away. Recent field studies indicate that loess high enough in coarse silt to be easily detected occurs only on those parts of the bluffs where Hamburg soils are found. Change in average particle size is not readily noticeable between sections of calcareous Peorian loess in the Port Byron-Seaton soil areas 1 to 2 miles from the bluff compared with those 25 or more miles distant in the Ipava-Clinton soil areas, even though the proportion of coarse silt tends to decrease and fine silt tends to increase. Differences are noticeable in the B2 horizons of the soils, however. Port Byron-Seaton soil areas have silt loam B2 horizons with very weak structural development; Muscatine-Fayette areas have light to medium silty clay loam B2 horizons with moderate to strong structural development; and Ipava-Clinton areas have heavy silty clay loam to light silty clay B2 horizons with strong structural development, including rather thick aggregate coatings (see descriptions in Appendix).

Smith (1942) decided that soil profile differences were probably not caused by fractionation of loess by the wind and suggested that mineralogical studies were needed "to determine whether differences exist between early and late Peorian deposits." But Jones and Beavers (1964a) in their study of the mineralogy of Seaton, Fayette, and Clinton, found no consistent relationship with distance from source, except possibly a decrease in the proportion of heavy minerals. They did note, however, more variability in the upper 20 inches of the soil profiles, particularly of the Seaton and Fayette, and suggested that these two soils were "developed in much thicker recent loess and much younger Peorian loess than the Clinton."

Climate

According to the best evidence available, the climate during the period of development of the deep loess soils in northwestern Illinois varied from cool to warm, moist to dry, and vice versa a number of times. Following retreat of the last continental glacier, temperature and rainfall probably remained within a range favorable to the growth of plants.

A period of perhaps 2,000 years duration, somewhat warmer and drier than present, seemingly occurred between about 6,000 and 4,000 B.P. (Flint, 1947) or about 4,050-2,050 B.C. Because grass is the climax vegetation in dry areas, it is possible that this hypsithermal period (Deevey and Flint, 1957), together with more recent shorter dry periods, may have been responsible for the wide extent of prairie and resulting Mollisolic soils in this region.

From about 1,000 B.C. to the middle 1,800's A.D. several cool periods alternated with warm periods (Russell, 1941). Numerous mountain glaciers formed during the colder periods and melted during the warmer periods. It was probably during this time that forests began encroaching on the prairie, resulting in the formation of Alfisolic soils and their intergrades. This encroachment began along the main stream valleys and had progressed from these valleys somewhat more to the east than to the west. It was apparently continuing until halted by clearing and cultivation.

Regardless of fluctuations in temperature and rainfall, the net effect in the soils in northwestern Illinois was (1) leaching of carbonates from the A, B, and upper C horizons, (2) partial removal of bases from the A and B horizons, replaced with equivalent amounts of hydrogen, (3) partial removal of iron and aluminum from the sola and a proportionate increase in silicon, and (4) slight to moderate fine clay formation with some translocation and accumulation in the B horizon.

Oxidation or Drainage

The combined influence of topography and depth to water table produced a range in soil profile color in the soils studied from an overall gray (i.e., poorly oxidized or poorly drained), to an overall brown or yellowish brown (i.e., well-oxidized or well-drained). Between these extremes various shadings or combinations of gray and brown or yellowish brown occur, including mottlings, so that poorly oxidized, imperfectly oxidized, moderately well-oxidized, and well-oxidized soil profiles are recognized.

Because loess is a medium-textured, moderately permeable material in which air and water movement are relatively free and the water table is normally deep under high, narrow ridges and shallow only in the footslopes and depressions or broad nearly level areas, soil drainage sequences or hydrosequences are complete in many places. Poorly oxidized soils formed in those nearly level to depressional areas where the water table was at or near the surface during most of the year because of lack of drainage outlets (e.g., Traer silt loam and Sable silty clay loam). Well-oxidized soils formed in those rolling to steep areas where the water table tended to remain below the soil solum (e.g., Fayette silt loam and Tama silt loam) (see water table discussion on page 49).

Vegetation and Organisms

The kind of native vegetation, including all associated plant and animal life, that occupied an area for a considerable time (perhaps 1,000 years or more) was responsible for certain distinguishing features in the soils of the area. Without some form of permanent plant cover, little or no organic matter would have accumulated and no resulting soil characteristics would have formed.

Two contrasting kinds of native vegetation, tall-grass prairie and deciduous forest, occupied the landscape in northwestern Illinois when settlers first entered the region in the early nineteenth century. Wet prairie or marsh vegetation, as well as some bog vegetation, were also present, but are included with prairie in this discussion.

The net effect on all soils of both kinds of native vegetation was an accumulation of organic matter on the surface and within the topsoil layer. At the time of settlement this accumulation was probably just reaching its maximum for the environment under which most of the dark-colored soils or Mollisols developed, but was probably already at or slightly beyond maximum for the light-colored soils or Alfisols. However, under cultivation and present cropping practices, organic matter is declining rapidly in both kinds of soils.

Under prairie vegetation the soils developed thick, very dark brown to black A1 horizons in which the dark color fades gradually below 10 to 15 inches into a lighter colored B horizon. Areas of these soils are distinguished on the colored Soil Association Map by "A" in the symbol (e.g., 1A, 2A, 3A, and so on). Under forest vegetation the soils developed thin (1- to 5-inch) dark gray to dark brown or black A1 horizons in which the dark color changes abruptly to light colors at the contact with a well-developed, moderately thick A2 horizon. Areas of these soils are indicated on the soil association map by "B" in the symbol (e.g., 1B, 2B, 3B, and so on). These latter soil areas are further distinguished on the map by a pattern of fine black stippling. Figure 8, page 33, also shows vegetation distribution in the study area.

In many places between the forest and prairie areas a narrow belt of combined tree and grass vegetation was present at the time of clearing and cultivation. It is thought that forest was encroaching on prairie under the prevailing climatic environment. Soils in these areas differ from Mollisols in having an A2 horizon. They differ from typical Alfisols in having a thicker A1 and a relatively thinner A2. No areas of these intergrade soils were considered large enough to show separately on the Soil Association Map. Most were included with the Alfisols, but some areas were included with Mollisols for convenience and map simplicity.

Degree of Weathering

Although some weathering may have taken place during loess deposition time (and this potential would be greatest at the greatest distance from source), the final removal of carbonates from the soil sola, as well as present physical profile formation, took place primarily after loess deposition ended in northwestern Illinois.

On steep slopes at or near the bluffs where erosion almost kept pace with soil formation, very weakly developed soils may be found (e.g., Timula silt loam). In other areas, under an environment in which little or no erosion or deposition took place and where excess water collected and percolated through the soil, the sola formed rapidly and soils of relatively advanced development are present (e.g., Denny silt loam). Between these two extremes are the three developmental groups of Mollisols discussed in detail (pages 32 to 40) and Alfisols discussed on pages 40 to 49. Both Mollisols and Alfisols are divided into the three degrees of soil profile development primarily on differences in texture of the B horizon, although structural development and aggregate coatings in the B also differ significantly. Other differences are indicated from a study of the laboratory data.

Where undisturbed and untreated, the imperfectly oxidized Mollisolic soils of this study (i.e., Muscatine silt loam and Ipava silt loam) seem to have reached a maximum accumulation of organic carbon for the present environment. Although range of organic carbon in the upper A1 of Muscatine encompasses that of soils located near the boundary between Muscatine and Ipava in the field, the averages are similar (Table 11). Also the range of organic carbon in the lower A1 plus A3 of Muscatine encompasses that of the borderline soils, but the average is lower in the borderline soils and a more rapid decrease in organic matter is indicated.

In the Ipava soils, in both the upper A1 and lower A1 plus A3 horizons, the range in organic carbon tends to be lower than for the Muscatine or borderline soils. Also the averages are lower, indicating that organic matter accumulation in Ipava is probably beyond maximum and is declining. That the decrease will continue is borne out by characteristics of the soils included in the recognized next stronger stage of development. This developmental group of soils is represented by Herrick silt loam which has a slightly grayish A1 and an incipient A2 horizon. Herrick soils are not included as part of the present study. The Joy silt loam soils probably have not reached an organic-matter maximum as yet and should continue to increase. The Alfisols appear to have already passed maximum accumulation of organic matter.

Average cation exchange capacities in the B2 horizons of the soils studied (Table 12) increase with increased development in the well- and moderately well-oxidized Alfisols and in the moderately well- and imperfectly oxidized Mollisols. They tend to increase as drainage class or oxidation decreases or becomes poorer. These increases are undoubtedly caused by increased clay content in both situations. However, most of the ranges overlap and the data are too meager to be conclusive. Also averages for the imperfectly oxidized Alfisols and well-oxidized Mollisols decrease with increased development, but again the data are much too meager for valid comparisons and trends.

Developmental trends in exchangeable cations are not apparent in the soils studied. Exchangeable calcium in the A2 and B1 horizons averages higher in the Seaton soils than in either the Fayette catena or Clary catena, but in the B2, B3, and C1 it averages highest in the Fayette catena, although all ranges overlap. Exchangeable magnesium in part averages highest in the Clary catena compared with Seaton and Fayette catenas. Whether these differences in exchangeable calcium and exchangeable magnesium are caused by differences in the original parent material or by differential weathering is not known.

In the Mollisols exchangeable calcium averages highest in the Ipava-Tama soils, as does exchangeable magnesium in all horizons except the C1. This would seem to indicate differences in the parent material and possibly greater concentrations of elemental calcium and magnesium in the fine silt fraction compared with the coarse silt fraction. This, however, is not borne out by the data of Jones and Beavers (1964a).

The ratio of exchangeable calcium to exchangeable magnesium, on the other hand, narrows from the weakly developed through the moderately developed to the most strongly developed soils in both the Alfisols and Mollisols, although ranges again tend to overlap. Range and average calcium-magnesium ratios for the respective horizons (except A1) are shown in Table 13. Data for A1 horizons are not included because of possible differences caused by liming or other contamination.

Table 11. — Organic Carbon Content of A Horizons of Muscatine and Ipava Soils in This and Other Studies

Horizon and thickness	Muscatine		Muscatine-Ipava borderline		Ipava	
	No. of profiles	O.C. (%)	No. of profiles	O.C. (%)	No. of profiles	O.C. (%)
Upper A1 (0–10″)						
Range	11	5.36–2.54	6	4.26–2.57	10	4.05–2.51
Average		3.34		3.33		3.11
Lower A1 plus A3 (11–18″)						
Range	11	3.36–1.50	6	2.79–1.74	10	2.69–1.41
Average		2.34		2.12		2.00
Decrease upper A to lower A						
Average		1.00		1.21		1.11

Table 12. — Average Cation Exchange Capacities in me./100 g. of B2 Horizons of Some Alfisols and Mollisols Studied

	Well-oxidized soils	No. of profiles	Mod. well-oxidized soils	No. of profiles	Imperfectly oxidized soils	No. of profiles
Alfisols						
	Seaton	2				
Range	14.4–16.8					
Average	15.5					
	Fayette	4	Rozetta	1	Stronghurst	3
Range	15.6–23.6		18.9–21.2		21.8–28.5	
Average	19.8		19.8		26.2	
	Clary	2	Clinton	2	Keomah	2
Range	18.7–21.7		22.4–27.4		21.5–27.5	
Average	20.1		24.8		24.9	
Mollisols						
			Joy	1	Joy	1
Range			15.8–16.5		16.3–21.2	
Average			16.1		18.7	
	Tama	1	Tama	2	Muscatine	5
Range	21.5–23.1		15.3–24.7		23.5–29.9	
Average	22.8		19.3		26.3	
	Tama	1			Ipava	4
Range	21.4–22.2				24.5–30.9	
Average	21.8				27.8	

Table 13. — Average Ratio of Exchangeable Calcium to Magnesium in Various Horizons of Soil Catenas Studied

	Alfisols				
	A2	B1	B2	B3	C1
Seaton (2 profiles)					
Range	3.5–4.5	2.8–3.7	2.2–2.8	2.0–2.5	1.6–2.3
Average	4.0	3.3	2.5	2.3	1.9
Fayette catena (9 profiles)					
Range	.9–8.3	1.3–4.9	1.2–2.6	1.1–2.4	1.0–1.8
Average	3.6	2.4	1.8	1.7	1.5
Clary catena (7 profiles)					
Range	.1–6.8	.3–3.9	.5–2.3	.7–1.6	1.1–1.7
Average	2.3	1.6	1.3	1.3	1.5
	Mollisols				
	A3	B1	B2	B3	C1
Joy (2 profiles)					
Range	3.2–3.4	3.0–3.1	2.1–3.2	1.9–2.4	...
Average	3.3	3.1	2.6	2.1	1.8[a]
Muscatine catena (9 profiles)[b]					
Range	1.4–3.3	1.8–2.8	1.2–2.1	1.2–1.7	1.3–1.8
Average	2.4	2.2	1.8	1.5	1.6
Ipava catena (5 profiles)					
Range	1.7–3.2	1.3–2.0	1.1–2.4	1.1–1.9	1.2–1.9
Average	2.4	1.7	1.6	1.6	1.6

[a] Data from one profile only.
[b] Poorly oxidized soils not included.

Table 14. — Clay Mineralogy of Selected Soils; Quantitative Estimates Made on Basis of Relative Peak Heights; 1 = Less Than 15 Percent, 2 = 15-30 Percent, 3 = 30-70 Percent

Sample number	Horizon	Depth (in.)	Montmo-rillonite	Illite or mica	Kaolinite-chlorite
Fayette (Profile No. 4)					
18130	A2	6–10	3	2	2
18132	B21	16–25	3	2	2
18133	B22	25–36	3	2	2
18135	C1	46–56	3	2	1
18136	C2	56–73	3	2	1
Fayette (Profile No. 6)					
18887	A1	0–6	3	2	2
18888	A21	6–9	3	3	2
18890	B1	13–16	3	2	2
18892	B22	22–32	3	2	2
18894	B32	41–50	3	2	2
18895	B32	50–60+	3	2	2
Stronghurst (Profile No. 8)					
18092	A1	0–3	3	2	2
18093	A21	3–7	3	2	2
18095	A3–B1	12–15	3	2	2
18097	B22	19–23	3	2	2
18099	B3	29–40	3	2	1
18101	C2	50–59	3	2	1
Stronghurst (Profile No. 9)					
18924	A1	0–4	3	3	2
18925	A2	4–9	3	3	2
18926	B1	9–14	3	2	2
18928	B22	22–29	3	2	2
18930	C1	40–46	3	2	1
18931	C2	46–66	3	2	1
Rushville (Profile No. 18)					
20156	Ap	0–6	3	2	2
20157	A2	6–12	3	3	2
20159	B21	15–18	3	2	2
20161	B23	22–27	3	2	2
20163	B31	35–45	3	2	1
20166	C1	61–69	3	2	1
20170	C2	92–99	3	2	1
20173	C3	113–119	3	2	1
Muscatine (Profile No. 25)					
18082	A11	0–7	3	2	2
18083	A11	7–14	3	2	2
18085	A3	18–21	3	2	2
18087	B22	27–36	3	2	2
18089	B3	41–55	3	2	1
18091	C1	60–70+	3	2	1
Muscatine (Profile No. 27)					
19606	Ap	0–10	3	2	2
19607	A12	10–17	3	2	2
19608	A3	17–21	3	2	2
19610	B22	26–32	3	2	2
19612	B23	38–44	3	2	2
19614	B32	53–60	3	2	1
19616	C1	68–76	3	2	1
Muscatine (Profile No. 29)					
19630	Ap	0–7	3	2	2
19631	A12	7–14	3	2	2
19633	B21	20–26	3	2	2
19634	B22	26–31	3	2	2
19635	B23	31–37	3	2	2
19636	B24	37–47	3	2	2
19637	B3	47–57	3	2	2
19638	C1	57–65	3	2	1
19646	C2	119–124	3	2	1
19648	iron band	130–131	3	2	1
19650	C3	138–145	3	2	1

The various A and B horizons of the Mollisolic soil sola all have greater than 50 percent base saturation and most have more than 70 percent. The Alfisols range as low as 20 percent saturated where untreated. Under a virgin environment those soils losing organic matter from the A horizon, but continuing to accumulate clay in the B, may remain approximately at the same level of base saturation for a considerable time. Eventually the rate of mineral weathering and replenishing of bases will decrease, resulting in a de-

Table 15. — Potassium Content and Cation Exchange Capacity (CEC) of the Clay Fraction of Selected Soils; CEC Is on an Oven-Dry Basis

Sample number	Horizon	Depth (in.)	K_2O(%)	CEC (me./100g.)
Fayette (Profile No. 4)				
18130	A2	6–01	1.99	60.3
18132	B21	16–25	1.75	66.0
18133	B22	25–36	1.72	70.8
18135	C1	46–56	1.58	55.6
18136	C2	56–73	....	51.1
Fayette (Profile No. 6)				
18887	A1	0–6	1.80	49.2
18888	A21	6–9	2.60	54.1
18890	B1	13–16	2.00	60.1
18892	B22	22–32	1.97	65.3
18894	B32	41–50	1.85	62.3
18895	B32	50–60+	2.07	64.3
Stronghurst (Profile No. 8)				
18092	A1	0–3	2.05	49.7
18093	A21	3–7	2.56	51.6
18095	A3–B1	12–15	2.05	56.0
18097	B22	19–23	1.59	66.9
18099	B3	29–40	1.80	68.2
18101	C2	50–59	....	68.9
Stronghurst (Profile No. 9)				
18924	A1	0–4	2.93	30.8
18925	A2	4–9	2.48	54.0
18926	B1	9–14	2.03	59.6
18928	B22	22–29	1.68	69.3
18930	C1	40–46	1.71	74.9
18931	C2	46–66	1.53	59.2
Rushville (Profile No. 18)				
20156	Ap	0–6	1.90	52.3
20157	A2	6–12	2.57	42.5
20159	B21	15–18	2.42	48.9
20161	B23	22–27	1.54	65.8
20163	B31	35–45	1.32	64.2
20166	C1	61–69	....	64.5
20170	C2	92–99	....	66.4
20173	C3	113–119	....	63.4
Muscatine (Profile No. 25)				
18082	A11	0–7	2.00	53.0
18083	A11	7–14	2.34	66.8
18085	A3	18–21	1.85	65.4
18087	B22	27–36	1.45	68.9
18089	B3	41–55	1.58	70.4
18091	C1	60–70+	1.56	74.3
Muscatine (Profile No. 27)				
19606	Ap	0–10	2.39	67.3
19607	A12	10–17	2.19	61.1
19608	A3	17–21	2.28	61.2
19610	B22	26–32	1.83	69.5
19612	B23	38–44	1.70	63.0
19614	B32	53–60	1.85	74.4
19616	C1	68–76	....	57.1

crease in plant nutrient elements with an increase in hydrogen and a corresponding increase in soil acidity. No consistent trends in percent of base saturation are apparent among the Mollisolic profiles or among the Alfisolic profiles of the three developmental groups of soils studies.

The primary reason or reasons for the formation of the three general developmental stages of soils outlined in this study may not be completely known. The slightly different lengths of weathering caused by the presence of different thicknesses of Late Peorian or Recent loess, as well as possible differences in source materials, may be of some significance. A different proportion of coarse silt to fine silt and coarse clay to fine clay may be important.

Mineralogy of Soils

Estimates of clay mineral content of eight profiles are listed in Table 14. These data reflect the montmorillonitic character of soils in northwestern Illinois and are consistent with previous data from several sources (see literature review on page 3). Data for cation exchange capacity and potassium content are given in Table 15. The cation exchange data reflect accumulation of montmorillonite in the B horizon. This montmorillonite is of very small particle size ($<0.2\mu$) and is easily translocated downward in the profile, leaving a concentration of illite or mica in the surficial horizons. This higher illite content is reflected by larger potassium values in the surficial horizons. Also the reduced area for the montmorillonite peak on the diffractions for A1 horizons of Fayette and Muscatine (Fig. 17) reflect the eluviation of montmorillonite from this horizon.

Potassium treatment of the clay causes much of the montmorillonite to collapse, particularly that in the upper portions of the profile. Comparison of the 10 to 7A ratio for the magnesium-saturated with the potassium-saturated samples indicates that a large proportion of the montmorillonite collapses (Fig. 17). This characteristic is attributed to montmorillonite of high surface charge and the vermiculite. Much of the remaining montmorillonite in the upper horizons collapses to about 14A. This characteristic of soil clays in this area was noted earlier by Jones and Beavers (1964a) and is attributed to the formation of sesquioxide polymers, particularly aluminum varieties, between adjacent montmorillonite particles. The interlamellar space thus blocked will not allow collapse to 10A with potassium saturation. The perfection and development of these interlayers is greatest in the surface horizon where in some soils no montmorillonite, or very little, is capable of swelling to 17A, but displays a 14A peak because the interlayers are capable of satisfying charge deficiencies of adjacent or overlying and underlying particles. Such a mineral has been called chloritized vermiculite or pedogenic chlorite. The surface horizons (Fig. 17) do not display this characteristic to the extent displayed by surficial horizons of the Alfisols in the study of Jones and Beavers (1964a). However, the diffraction patterns of Stronghurst profile numbers 8 and 9 do display this characteristic. In contrast, the Mollisols are notable in that they do not have such well-developed interlayers. The Rushville profile is notable in that it displays a particularly well-crystallized low-charge montmorillonite throughout and considerable vermiculite in the surface layer.

In addition to montmorillonite and chloritized montmorillonite, minor amounts of kaolinite and chlorite occur in these soils. There is considerably more kaolinite than chlorite. It could not be determined from diffraction analyses alone if kaolinite and chlorite occurred in greater amounts in the Stronghurst and Fayette profiles of La Salle County, where these minerals would be expected to be present in larger amounts because of proximity to the Illinois River. Quartz occurs in amounts of less than 10 percent in some samples from most profiles.

In this area the effect of internal soil drainage is expressed in clay mineralogy by lower amounts of interlayer sesquioxide polymers in soils of imperfect or poor drainage. Content of montmorillonite tends to be higher throughout the solum in the poorly drained soils.

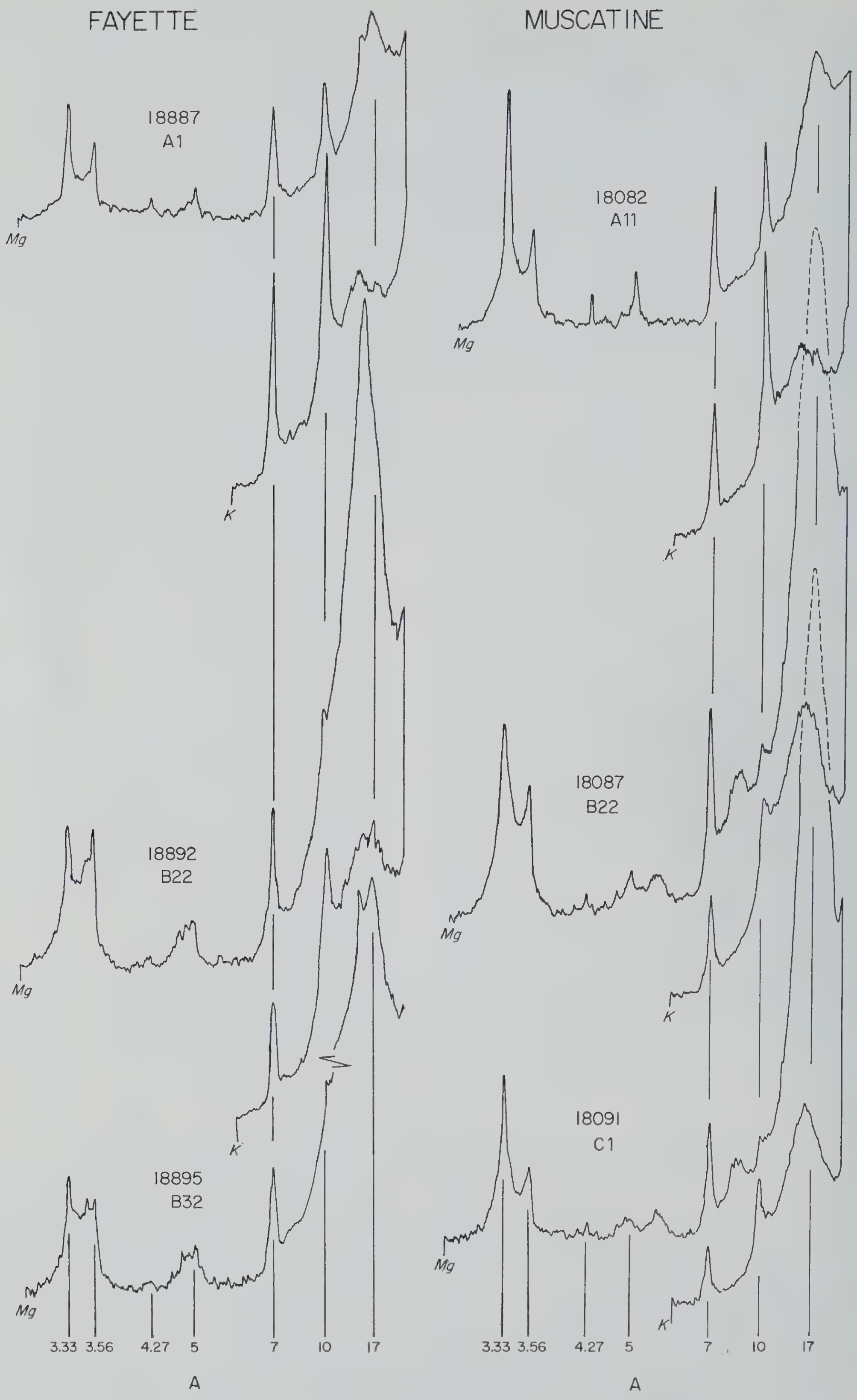
Classification and Correlation of Deep Loess Soils

Classification

Soils may be classified in many ways, depending on the purpose to be served. The intent here is to classify the deep loess soils of northwestern Illinois according to the system currently in use developed by the Soil Survey Staff, USDA (1960). Only those loess soils occurring in soil associations 1, 2, and 3 are classified (see colored Soil Association Map). However, it should be remembered many other soils developed from outwash, till, alluvium, and other parent materials are also present in the area studied.

The present soil classification system is based largely on properties of the various horizons in the soil profiles. The soils are placed in six categories (i.e., Order, Suborder, Great Group, Subgroup, Family, and Series) (Table 16). The basis for differentiation in the various categories and the terms used are explained briefly below. For further details see publications of the classification system, Soil Survey Staff, USDA (1960, 1964, 1967, and later).

Orders (the highest category in the system) are based on key horizons whose presence provides an insight to the major soil-forming processes in the genesis of the soils or whose absence indicates a lack of de-



Clay mineral diffraction patterns of Muscatine and Fayette profiles. Mg refers to magnesium and K refers to potassium saturation. All samples were ethylene glycol solvated. (Fig. 17)

Table 16. — Classification of Loess Soils in Northwestern Illinois in Association Areas 1, 2, and 3

Order	Suborder	Great Group	Subgroup	Family	Series
Entisols	Orthents	Udorthents	Typic Udorthents	Coarse silty, mixed, calcareous, mesic	Bold
					Hamburg
Inceptisols	Ochrepts	Eutrochrepts	Typic Eutrochrepts	Coarse silty, mixed, mesic	Timula
			Dystric Eutrochrepts	Coarse silty, mixed, mesic	Hopper
Mollisols	Aquolls	Haplaquolls	Typic Haplaquolls	Fine silty, mixed, noncalcareous, mesic	Hartsburg
					Sable
		Calciaquolls	Typic Calciaquolls	Fine silty, mixed, mesic	Harpster
	Udolls	Hapludolls	Typic Hapludolls	Fine silty, mixed, mesic	Joy[a]
					Port Byron
					Tallula
			Aquic Hapludolls	Fine silty, mixed, mesic	Biggsville
		Argiudolls	Typic Argiudolls	Fine silty, mixed, mesic	Elkhart
					Tama
			Aquic Argiudolls	Fine silty, mixed, mesic	Muscatine[b]
				Fine, montmorillonitic, mesic	Ipava
	Albolls	Argialbolls	Argiaquic Argialbolls	Fine silty, mixed, mesic	Edgington
Alfisols	Aqualfs	Albaqualfs	Mollic Albaqualfs	Fine, montmorillonitic, mesic	Denny
			Typic Albaqualfs	Fine, montmorillonitic, mesic	Rushville[c]
		Ochraqualfs	Typic Ochraqualfs	Fine, montmorillonitic, mesic	Traer
			Aeric Ochraqualfs	Fine silty, mixed, mesic	Stronghurst
				Fine, montmorillonitic, mesic	Keomah[d]
			Udollic Ochraqualfs	Fine silty, mixed, mesic	Atterberry
				Fine, montmorillonitic, mesic	Clarksdale
	Udalfs	Hapludalfs	Typic Hapludalfs	Fine silty, mixed, mesic	Decorra
					Fayette
					Rozetta
					Seaton
					Sylvan
				Fine, montmorillonitic, mesic	Clary[e]
					Clinton[e]
			Mollic Hapludalfs	Fine silty, mixed, mesic	Downs
					Fall
					Mt. Carroll
					Sicily

[a] Profile No. 20 (see description p. 89) is an Aquic Hapludoll rather than a Typic Hapludoll.
[b] Profile No. 27 (see description p. 99) has a thicker dark-colored A and upper B than normal for Muscatine and is an Aquic Cumulic Argiudoll.
[c] Profile No. 18 is borderline to a Mollic Albaqualf.
[d] Profile No. 16 has a brighter-colored B horizon than normal for Keomah and should be classified as an Aquic Hapludalf.
[e] Clary profile No. 13 and Clinton profile No. 14 are fine silty rather than fine.

velopment. The orders include soils that have had similar kinds and similar degrees of processes active in their formation.

Suborders are subdivisions of orders that include soils having similar genesis. Color associated with various degrees of wetness during soil development is the main characteristic used to define many suborders. Differences caused by variations in climate and associated vegetation are also used. Some orders are divided into suborders on the basis of chemical or mineralogical differences that either control the kind and degree of soil development or result from soil formation. In some orders, extremes in quartz sand content are used for differentiating suborders.

Great groups are subdivisions of the suborders. They are relatively uniform in the kind and arrangement of significant horizons and their degree of development. Presence or absence of certain diagnostic horizons is used in differentiating many great groups. Some of the horizons used include those containing illuvial clay, iron and humus, thick dark-colored surface horizons, and pan horizons that restrict root penetration or water movement. Where differences in horizons are not usable, other features such as wide differences in base saturation, irreversible hardening, tonguing of eluvial horizons into illuvial horizons, and low soil temperature are the basis for differentiation of great groups.

Subgroups are subdivisions of the great groups and are defined in relation to the great groups. Subgroups consist of either the central concept of the great group (Typic), intergrades to other great groups, to suborders, or to orders, or extragrades which have properties that are not representative of any great group, suborder, or order. The intergrades have properties beyond the central concept of the great group, but have some properties indicative of other great groups, suborders, or orders. Extragrades do not intergrade to any other established class in the great group, suborder, or order.

Families are subdivisions of subgroups and are relatively uniform in properties which affect plant growth. Families are based on many of the same properties used for defining soil series, but the properties are permitted a wider range in the family category. The main properties considered in families are texture, mineralogy, reaction, and temperature. Other properties sometimes used are permeability, consistence, and soil thickness. *Coarse silty* soils average less than 18 percent clay and less than 15 percent sand coarser than very fine in the upper 20 inches of the argillic horizon (B horizon which has significant clay accumulation) or between depths of 10 and 40 inches if an argillic horizon is not present. *Fine silty* soils have less than 15 percent sand, but average between 18 and 35 percent clay at the same depths. *Fine* soils average, within the same depth limits, more than 35 percent clay but less than 60 percent clay. *Mixed* in the family category indicates that the clay fraction is not dominated by any particular mineral. *Montmorillonitic* means the clay is dominated by the expanding clay mineral montmorillonite. *Calcareous* means sufficient limestone particles are present that the soil mass will effervesce with dilute hydrochloric acid. *Noncalcareous* means that the soil mass does not effervesce with dilute hydrochloric acid. *Mesic* refers to soil temperature and indicates that the mean annual soil temperature at a depth of 20 inches is between 47 and 59° F.

Series are subdivisions of the soil families and have genetic horizons similar in differentiating characteristics and arrangement in the soil profile. If genetic horizons are thin or absent the soil properties within a defined depth limit, usually the upper 40 inches, must be relatively uniform. Differentiating characteristics among series include such morphological features as kind, thickness, and arrangement of horizons as well as their color, structure, reaction, consistence, mineralogical and chemical composition, and texture below the A horizon. Descriptions of the soil series included in this study are given in the Appendix.

Four soil orders are represented by the loess soils of northwestern Illinois. These are the Entisols, Inceptisols, Mollisols, and Alfisols. The following discussion explains the terms used in the various categories in Table 16 as they apply to the deep loess soils in the area studied. The terms used are italicized in each case when they are first introduced in the discussion.

Entisols are very weakly developed soils without distinct horizons other than a slightly darkened surface layer. The *Orthent* suborder of Entisols includes soils that have textures of loamy very fine sand or finer, lack diagnostic horizons, and have an organic-matter content that decreases regularly with depth until it reaches a level of 0.35 percent or less within a depth of 50 inches. The *Udorthent* great group includes soils that have a mean summer soil temperature that differs by 9° F. or more from the mean winter soil temperature at a depth of 20 inches and are not dry between depths of 10 and 40 inches in most years for as much as 60 consecutive days nor dry in some subhorizons between these depths for as much as 90 cumulative days. The *Typic Udorthent* soils fit the central concept of the Udorthent great group and therefore have the properties given above for that great group.

Bold and Hamburg, the two soil series in the Entisol order, are well drained, contain less than 18 percent average clay, and are calcareous.

Inceptisols are weakly developed soils having only indistinctly expressed horizons. They are usually moist between depths of 10 and 40 inches. They have a cambic horizon which is an altered horizon that has been leached of some bases, including carbonates, has lost iron and aluminum, or has structural development, but has no appreciable gain in clay or other mineral substances. The *Ochrept* suborder of the Inceptisols includes soils that are light colored, have 9° F. or more difference between the mean summer and mean winter soil temperature at a depth of 20 inches, have an exchange complex dominated by crystalline aluminosilicate clay minerals, and are moderately well- or well-drained. The *Eutrochrept* great group includes soils that have carbonates in the cambic horizon or in the C horizon, but within the soil profile, and are more than 60 percent saturated with bases in some horizon within a depth of 30 inches. The *Typic Eutrochrept* subgroup includes soils that have carbonates in the cambic horizon, whereas the *Dystric Eutrochrept* subgroup includes soils which have carbonates in the C horizon. Timula and Hopper, the two series included as Inceptisols, are well drained and have less than 18 percent average clay content. Timula is calcareous at depths between 15 and 40 inches. Hopper is noncalcareous to a depth of 40 inches.

Mollisols are mineral soils that have a dark surface horizon (mollic epipedon) more than 10 inches thick unless the total solum is thin and base saturation greater than 50 percent throughout the profile. They developed under prairie vegetation. The dark layer may be either massive or hard to very hard when dry, but not both; it has color values darker than 3.5 when moist and 5.5 when dry and chromas of less than 3.5 when moist; and it has more than 0.58 percent organic carbon (1 percent organic matter) throughout the horizon.

The *Aquoll* suborder of the Mollisol order includes soils that are naturally wet and poorly oxidized and usually occur on nearly level areas or in slight depressions. Even though they may now be artificially drained, they have gray (gleyed) B horizons of low chroma indicative of the wet conditions under which they developed. Soils in the *Haplaquoll* great group lack argillic horizons or horizons which show evidence of significant clay accumulation, and have mean annual soil temperatures of 47° F. or higher. The *Typic Haplaquoll* subgroup soils fit the central concept of the Haplaquoll great group, with a mollic epipedon between 10 and 24 inches thick. Hartsburg is calcareous between depths of 15 and 40 inches, whereas Sable is noncalcareous to 40 inches. The *Calciaquoll* great group and the *Typic Calciaquoll* subgroup soils are strongly calcareous within a depth of 16 inches. They lack an argillic horizon, have a dark surface less than 16 inches thick, and have a mean annual soil temperature of 47° F. or higher. Harpster, a Typic Calciaquoll, is calcareous in the surface.

The *Udoll* suborder includes soils that have higher chromas and are better drained than the Aquolls. They are usually moist in the cambic or argillic horizon, but may be dry occasionally in some horizon between depths of 10 and 40 inches. The *Hapludoll* great group includes the Udolls that lack argillic horizons. *Typic Hapludolls* immediately below the mollic epipedon, or within 6 inches of the lower boundary, have chromas of 3 or more and no mottles with chromas of 2 or less. They have mollic epipedons less than 24 inches thick and little or no clay accumulation in the B. *Aquic Hapludolls* are somewhat wetter than the Typic Hapludolls and have mottles with chromas of 2 or less within 6 inches of the lower boundary of the mollic epipedon. The *Argiudoll* great group includes the Udolls that have argillic horizons (i.e., B horizons with 1.2 times more clay than in the A horizons). *Typic Argiudolls* are similar to Typic Hapludolls in color and also thickness of mollic epipedon, but have a significant accumulation of clay in the B horizon. *Aquic Argiudolls* are wetter than Typic Argiudolls and have mottles with chromas of 2 or less within 6 inches of the lower boundary of the mollic epipedon.

The *Alboll* suborder of the Mollisols includes soils that are wet and poorly oxidized. They have an albic horizon (gray A2) immediately below the mollic epipedon that is at least 4 inches thick with chromas of 2 or less in more than half of its matrix. The *Argialboll* great group has an argillic horizon and the *Argiaquic Argialboll* subgroup soils have a somewhat gradual textural change from the A to the B horizon.

Alfisols are mineral soils in which the surface layer, termed an ochric epipedon, is too light in color, too low in organic carbon, or too thin to be a mollic epipedon. They are usually moist in some part of the soil between depths of 10 and 40 inches. They have an argillic B horizon and base saturation of 35 percent or more at a depth of 50 inches below the top of the argillic horizon or at 72 inches below the soil surface. Most of the Alfisols in northwestern Illinois were formed under deciduous forest vegetation.

The *Aqualf* suborder of the Alfisols includes poorly and imperfectly drained soils which show evidence of wetness in the form of mottles, iron-manganese concretions, or chromas of 2 or less in the albic (A2) horizon and in the matrix of the argillic horizon. The *Albaqualf* great group includes the Aqualfs that have an abrupt textural change from the A to the B horizon. *Typic Albaqualfs* are light colored in the surface, or if dark, the surface layer is less than 6 inches thick. *Mollic Albaqualfs* have a dark-colored A horizon between 6 and 10 inches thick. The *Ochraqualf* great group includes soils that are similar to the Albaqualfs in many respects, but do not have an abrupt textural change from A to the B horizon. *Typic Ochraqualfs* are poorly oxidized and have more gray colors and lower chromas in their argillic horizons than *Aeric Ochraqualfs,* which generally tend to be imperfectly drained. Both the Typic and Aeric Ochraqualfs have a surface layer, which if dark colored, is less than 6 inches thick. *Udollic Ochraqualfs* have a dark-colored surface layer from 6 to 10 inches thick. They have about the same color characteristics in the argillic horizon as the Aeric Ochraqualfs and also tend to be imperfectly drained.

The *Udalf* suborder of the Alfisols includes soils that are better drained than the Aqualfs and have brighter colors (higher chromas) in their argillic horizons. They tend to have distinct B horizons, although sometimes the amount of clay accumulation is small. The *Hapludalf* great group includes soils that have a regular or unbroken upper boundary of the argillic horizon, have no fragipan (silt pan), and have more than 9° F. difference between mean annual summer and winter soil temperatures. *Typic Hapludalfs* have light-colored surface layers, or if dark, the surface layer is less than 6 inches thick. They have chromas of 3 or more in the upper B horizon and also are free of mottles with chromas of 2 or less in the upper 10 inches of the B horizon. The *Mollic Hapludalfs* are similar to the Typic Hapludalfs, except that they have a dark surface layer that is from 6 to 10 inches thick. In northwestern Illinois the Mollic Hapludalfs are prairie-forest transition soils.

Correlation

Soil correlation is a continuing process in which characteristics and properties of various soils are evaluated and related to each other. The aim is to keep unlike soils apart and the place those with similar characteristics into the same catgories, including the same soil series. Sometimes insufficient information and data on soils may lead to inaccurate correlations. In those cases, a change in correlation is made when more complete information becomes available.

Many of the deep loess soils in northwestern Illinois are correlated in adjacent states of Iowa and Wisconsin, and to some extent in Minnesota. A few may also occur in Missouri. Accurate descriptions and detailed laboratory measurements of physical and chemical properties of various horizons in the soil profile such as reported in this publication are the basis for sound soil correlations.

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Appendix: Profile Descriptions and Data

Many present and former members of the Illinois State Soil Survey and the USDA Soil Conservation Service took part in describing and sampling the soil profiles and in determining the data included here.

Sampling location is by county, surveyor's township, range, and section number, and by 160-acre, 40-acre, and 10-acre parts of the section. For convenience in locating a sampling site, the section divisions are the reverse of the method used in the official land survey.

The number in parentheses following each soil type name is the Illinois soil type number. Samples from several profiles were collected before the introduction of modern methods of observing soil profiles and recording descriptions. These profiles were all redescribed but in some cases no attempt was made to relate individual horizons to the former sampling layers. If a horizon boundary was 2 inches or less from the boundary of a sampling layer, its depth limit was adjusted to correspond to that of the sampling layer.

Munsell color notation and consistence are all from freshly exposed, moderately moist soil material unless otherwise stated. Textures are field estimates and do not always coincide with laboratory data. pH, where given in the description, was determined in the field with a Hellige-Truog soil reaction kit. Consistence, structure, and aggregate coating nomenclature vary somewhat among the individual observers.

Material of gravel size (>2 mm. diameter) was present only as concretions of lime or iron-manganese and their weight percentages were not recorded. As much as 2 to 3 percent of the sand fraction consisted of iron-manganese concretions in most of the samples.

Profile No. 1 — Seaton Silt Loam (274)

Carroll County, T.25N., R.3E., Sec. 27, SW160, NW40, NE10

Pit for sampling dug in cultivated field on a 5-percent slope to south, approximately 30 feet south-southeast from crest of narrow ridge, 30 feet north from break to steep wooded slope, and about 1 mile east of Mississippi River bluff face. Parent material is Peorian loess more than 25 feet thick, calcareous at a depth of 70 inches, but including much fine and very fine sand throughout. Native vegetation was deciduous forest. Samples were taken in 1944 and data included in Ill. Exp. Sta. Bul. 587 (N.C.R. Pub. 46). The following description was written in 1956 about 300 feet north along a roadway because the sampling site had been landscaped as part of Mississippi Palisades State Park.

A_1, (0-5"), 16942 -- Dark grayish brown (10YR 3/2-4/2) friable silt loam; weak fine crumb; abundant fibrous roots; clear smooth boundary.

A_2, (5-10"), 16943-4 -- Dark grayish brown (10YR 4/2) friable silt loam; weak thin platy; thin gray patchy silica coatings; abundant fibrous root and worm casts; clear smooth boundary.

A_3-B_1, (10-17"), 16945-6 -- Dark brown (10YR 4/3) friable silt loam; weak thin to medium platy in place breaking to weak very fine to fine subangular blocky; few patchy gray silica coatings and few thin discontinuous brown clay films; moderately abundant roots and worm casts; clear smooth boundary.

B_2, (17-33"), 16947-51 -- Dark brown (10YR 4/3) friable heavy silt loam; moderate fine to medium subangular blocky; few thin gray patchy silica coatings and brown clay films; common roots; a few worm channels; gradual smooth boundary.

B_3, (33-60"), 16952-7 -- Dark brown (10YR 4/3) friable silt loam; weak medium to coarse subangular blocky fading to nearly structureless in lower part; few thin patchy gray silica coatings; very few roots and worm casts; gradual smooth boundary.

C_1, (60-70"), 16958-9 -- Brown to yellowish brown (10YR 5/3-5/4) friable silt loam; massive; clear smooth boundary.

C_2, (70-90"+), 16960 -- Yellowish brown to light yellowish brown (10YR 5/4-6/4) friable silt loam; massive; calcareous.

Lab. no.	Depth, in.	Horizon	Particle size distribution of < 2 mm. (in mm.) (%) Sand	Silt			Clay			Pores		Hydraulic conductivity, in./hr.	Moisture	
			Total 2-.050	Coarse .050-.020	Fine .020-.002	Total .050-.002	Coarse .002-.0002	Fine < .0002	Total < .002	Capillary, %	Non-capillary, %		1/3 atmos., %	15 atmos., %
16942	0-6	A1	13.0	50.9	25.7	76.6			10.4					
16943	6-9	A2	12.1	48.9	24.6	73.5			14.4					
16944	9-12	A2	11.0	47.0	22.9	69.9			19.1					
16945	12-15	A3	10.7	46.8	22.2	69.0			20.3					
16946	15-18	B1	11.2	45.7	20.6	66.3			22.5					
16947	18-21	B2	12.1	45.6	19.7	65.3			22.6					
16948	21-24	B2	11.5	46.2	19.6	65.8			22.7					
16949	24-27	B2	12.1	46.5	19.4	65.9			22.0					
16950	27-30	B2	12.8	48.3	18.6	66.9			20.3					
16951	30-33	B2	13.9	50.1	17.8	67.9			18.2					
16952	33-37	B3	15.5	48.5	18.2	66.7			17.8					
16953	37-40	B3	16.2	48.1	18.7	66.8			17.0					
16954	40-45	B3	17.9	47.1	19.0	66.1			16.0					
16955	45-48	B3	22.1	45.9	18.0	63.9			14.0					
16956	48-52	B3	21.6	45.6	17.8	63.4			15.0					
16957	52-60	B3	18.8	43.6	21.4	65.0			16.2					
16958	60-66	C1	19.9	52.1	13.4	65.5			14.6					
16959	66-70	C1	28.9	42.2	17.4	59.6			11.5					
16960	75-90+	C2	45.2	22.1	23.4	45.5			9.3					

Lab. no.	Exch. cations me./100g. soil Ca	Mg	K	Na	Exch. Ca / Exch. Mg	Cation exch. cap., me./100g.	Base saturation, %	pH 1:1 ratio	$CaCO_3$ equiv., %	Organic carbon, %	Bulk density	Soil tests lb. per acre P_1	P_2	K
16942	4.8	1.0			4.8	9.6	60	5.6		.94				
16943	5.8	1.3			4.5	10.3	69	5.5		.35				
16944	7.7	2.0			3.9	13.3	73	5.6		.35				
16945	8.2	2.4			3.4	4.5	73	5.6		.29				
16946	9.0	2.8			3.7	16.0	74	5.6		.18				
16947	9.2	3.3			2.8	16.5	76	5.6		.12				
16948	9.4	3.5			2.7	16.8	77	5.6		.06				
16949	8.8	3.4			2.6	16.1	76	5.6		.06				
16950	8.3	3.5			2.4	15.8	75	5.6		.06				
16951	7.6	3.2			2.4	14.3	76	5.7		0				
16952	7.6	3.3			2.3	14.2	77	5.8		0				
16953	7.7	3.5			2.2	14.4	79	5.9		0				
16954	7.7	3.5			2.2	14.2	79	5.9		0				
16955	7.1	3.3			2.2	13.2	79	6.0		0				
16956	7.6	3.7			2.0	14.2	80	6.0		0				
16957	8.2	4.1			2.0	15.3	80	6.0		0				
16958	8.2	3.5			2.3	14.0	84	6.1		0				
16959	6.9	3.0			2.3	11.8	84	7.1		0				
16960	8.8	2.9			3.0	11.7	100	8.1	13.0	0				

Profile No. 2 — Seaton Silt Loam (274)

Henderson County, T.11N., R.4W., Sec. 8, NE160, NW40, NW10

Sampled along roadside, on a 5-percent slope to south, about 100 feet northwest from steep wooded slope, approximately 40 rods south of section line, 30 rods north of road corner, and about 1 mile east of Mississippi River bluff. Parent material is Peorian loess more than 25 feet thick, calcareous at a depth of 95 inches. Native vegetation was deciduous forest. Soil samples were taken in 1944 and data included in Ill. Agr. Exp. Sta. Bul. 587 (N.C.R. Pub. 46). The following description was written in 1957 within a few feet of the sampling site.

A_1, (0-4"), 17053 -- Dark brown (10YR 3/3) very friable silt loam; weak fine crumb; clear smooth boundary.

A_2, (4-9"), 17054 -- Brown (10YR 4/3-5/3) friable silt loam; weak thin platy; clear smooth boundary.

A_3, (9-15"), 17055-6 -- Yellowish brown (10YR 5/4) friable silt loam; weak medium to coarse subangular blocky with patchy, dark brown (7.5YR 4/3) clay coatings intermingled with light yellowish brown (10YR 6/4) silica coatings; vesicular; clear smooth boundary.

B_1, (15-21"), 17057-8 -- Yellowish brown (10YR 5/4) friable to firm silt loam; moderate fine to medium subangular blocky with light yellowish brown (10YR 6/4) silica coatings and patchy lusterless dark brown (7.5YR 4/3) clay coatings; clear smooth boundary.

B_{21}, (21-27"), 17059-60 -- Brown (7.5YR 5/5) firm silt loam; moderate fine to medium subangular blocky with intermingled dark brown (7.5YR 4/3) clay coatings and light yellowish brown (10YR 6/4) silica coatings (silica is gray when dry); clear smooth boundary.

B_{22}, (27-34"), 17061-3 -- Yellowish brown (10YR 5/4) firm silt loam; moderate medium angular blocky with brown (7.5YR 4/3) patchy aggregate coatings and along vesicle and channel walls; gradual smooth boundary.

B_{31}, (34-44"), 17064-7 -- Brown (10YR 5/3) firm silt loam; weak medium to coarse prismatic with brown (7.5YR 4/3) patchy clay coatings on aggregates and along vesicle walls and with a few patches of light yellowish brown (10YR 6/4) silica coatings on vertical faces; pH 6.0; gradual smooth boundary.

B_{32}, (44-70"), 17068-72 -- Brown (10YR 4/3) friable silt loam; weak very coarse prismatic with thin patchy dark brown (7.5YR 4/2) coatings on vertical faces; pH 6.2; gradual smooth boundary.

C_1, (70-95"), 17073-4 -- Light brownish gray to pale brown (10YR 6/2-6/3) and brown (10YR 5/3) friable silt loam with common fine faint dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/6) mottles; massive; pH 6.4; clear smooth boundary.

C_2, (95-105"), 17075 -- Mixed dark yellowish brown (10YR 4/4), yellowish brown (10YR 5/6), light brownish gray (2.5Y 6/2), and light gray (2.5Y 7/2) friable silt loam; massive; calcareous.

Lab. no.	Depth, in.	Horizon	Particle size distribution of < 2 mm. (in mm.) (%) Sand Total 2-.050	Silt Coarse .050-.020	Silt Fine .020-.002	Silt Total .050-.002	Clay Coarse .002-.0002	Clay Fine < .0002	Clay Total < .002	Pores Capillary, %	Pores Noncapillary, %	Hydraulic conductivity, in./hr.	Moisture ⅓ atmos., %	Moisture 15 atmos., %
17053	0-4	A1	1.6	62.7	24.3	87.0			11.4					
17054	4-9	A2	1.5	62.1	24.3	86.4			12.1					
17055	9-12	A3	1.5	61.0	25.0	86.0			12.5					
17056	12-15	A3	1.3	60.0	23.6	83.6			15.1					
17057	15-18	B1	1.3	57.2	23.8	81.0			17.7					
17058	18-21	B1	1.4	56.7	22.1	78.8			19.8					
17059	21-24	B21	1.4	55.5	22.1	77.6			21.0					
17060	24-27	B21	1.3	57.1	19.5	76.6			22.1					
17061	27-30	B22	1.4	55.0	21.6	76.6			22.0					
17062	30-32	B22	1.2	54.7	23.5	78.2			20.6					
17063	32-34	B22	1.3	54.7	24.3	79.0			19.7					
17064	34-36	B31	1.4	56.1	23.1	79.2			19.4					
17065	36-38	B31	1.6	56.7	23.1	79.8			18.6					
17066	38-40	B31	1.4	58.6	22.6	81.2			17.4					
17067	40-44	B31	1.3	60.0	22.0	82.0			16.7					
17068	44-48	B32	1.6	60.0	21.1	81.1			17.3					
17069	48-52	B32	1.9	56.9	23.0	79.9			18.2					
17070	52-56	B32	2.5	56.6	22.6	79.2			18.3					
17071	56-60	B32	3.0	56.8	22.8	79.6			17.4					
17072	60-70	B32	3.4	59.1	21.0	80.1			16.5					
17073	70-80	C1	3.4	60.2	20.2	80.4			16.2					
17074	80-90	C1	5.3	63.3	16.9	80.2			14.5					
17075	95-105	C2	9.0	62.5	18.2	80.7			10.3					

Lab. no.	Exch. cations me./100g. soil				Exch. Ca / Exch. Mg	Cation exch. cap., me./100g.	Base saturation, %	pH 1:1 ratio	$CaCO_3$ equiv., %	Organic carbon, %	Bulk density	Soil tests lb. per acre		
	Ca	Mg	K	Na								P_1	P_2	K
17053	10.2	2.3			4.5	12.2	99	6.5						
17054	5.5	1.6			3.5	8.4	76	6.2		.87				
17055	5.2	1.3			4.1	7.8	77	6.1		.66				
17056	5.3	1.5			3.5	7.9	81	6.0		.37				
17057								5.8		.29				
17058	7.2	2.6			2.8	11.6	81	5.7		.32				
17059								5.6		.28				
17060	7.9	3.7			2.2	14.5	75	5.1		.33				
17061								5.8		.23				
17062	7.4	3.3			2.3	14.4	73	5.3		.21				
17063								5.5		.23				
17064	7.5	3.1			2.4	13.1	79	5.6		.15				
17065								5.6		.15				
17066	7.3	3.0			2.4	12.1	83	5.6		.13				
17067								5.8		.12				
17068	7.8	3.1			2.5	12.0	87	6.0		.14				
17069								6.0		.16				
17070	7.8	4.1	.20	.21	1.9	13.7	90	5.9		.16				
17071	7.4	4.0	.20	.23	1.9	13.4	88	6.0		.14				
17072	7.3	3.8	.19	.24	1.9	12.9	89	6.1		.18				
17073	7.2	4.1	.19	.26	1.8	13.0	90	6.2		.13				
17074	6.5	4.0	.18	.22	1.6	12.0	91	6.3		.14				
17075									16.0	.13				

Profile No. 3 — Fayette Silt Loam (280)

Carroll County, T.25N., R.4E., Sec. 26, SW160, SE40, SE10

Sampled in a cultivated field on 5-percent slope to southwest, about 25 rods west of road corner and 20 feet south of fencerow along abandoned road. Parent material is Peorian loess 15 feet thick, calcareous at 88 inches. Native vegetation was deciduous forest. Samples were taken in 1944 and data included in Ill. Agr. Exp. Sta. Bul. 587 (N.C.R. Pub. 46). The following description was written in 1960 approximately 200 feet north along roadside of newly graded road.

Ap, (0-6"), 16961 -- Very dark grayish brown to dark gray (10YR 3/2-4/1) friable silt loam; moderate fine crumb to granular; clear smooth boundary.

A_2, (6-13"), 16962-3 -- Brown to yellowish brown (10YR 5/3-5/4) friable silt loam; weak to moderate thin platy; clear wavy boundary.

B_1, (13-16"), 16964 -- Brown (10YR 4/3) firm heavy silt loam; moderate fine to medium subangular blocky with dark grayish brown (10YR 4/2) coatings and patches of gray silica; clear smooth boundary.

B_{21}, (16-28"), 16965-8 -- Dark brown (10YR 4/3) firm silty clay loam; moderate medium prismatic breaking to strong medium subangular blocky with dark grayish brown (10YR 4/2) coatings; clear smooth boundary.

B_{22}, (28-42"), 16969-73 -- Dark brown (10YR 4/3) firm silty clay loam; moderate coarse prismatic breaking to moderate medium subangular blocky with dark grayish brown (10YR 4/2) coatings; clear smooth boundary.

B_3, (42-62"), 16974-7 -- Brown to grayish brown (10YR 4/3-5/2) friable silty clay loam; moderate coarse prismatic breaking to weak medium to coarse subangular to angular blocky with thin patchy brown to dark brown (10YR 4/3) coatings; clear smooth boundary.

C_1, (62-88"), 16978-80 -- Dark yellowish brown to yellowish brown (10YR 4/4-5/4) friable silt loam; weak coarse angular blocky to massive with streaks of grayish brown (10YR 5/2); clear smooth boundary.

C_2, (88-108"), 16981-2 -- Yellowish brown to light yellowish brown (10YR 5/4-6/4) friable silt loam; massive; calcareous.

Lab. no.	Depth, in.	Horizon	Particle size distribution of < 2 mm. (in mm.) (%)							Pores		Hydraulic conductivity, in./hr.	Moisture	
			Sand	Silt			Clay							
			Total 2-.050	Coarse .050-.020	Fine .020-.002	Total .050-.002	Coarse .002-.0002	Fine < .0002	Total < .002	Capillary, %	Non-capillary, %		⅓ atmos., %	15 atmos., %
16961	0-6	Ap	10.7	46.0	31.5	77.5			11.8					
16962	6-9	A2	8.2	42.1	34.1	76.2			15.6					
16963	9-13	A2	8.0	40.4	32.7	73.1			18.9					
16964	13-16	B1	7.9	39.7	30.8	70.5			21.6					
16965	16-19	B21	8.0	38.2	29.3	67.5			24.5					
16966	19-22	B21	8.0	36.9	27.5	64.4			27.6					
16967	22-25	B21	8.7	36.4	26.0	62.4			28.9					
16968	25-28	B21	11.0	35.8	23.8	59.6			29.4					
16969	28-31	B22	10.9	36.5	24.0	60.5			28.6					
16970	31-33	B22	9.0	38.3	24.8	63.1			27.9					
16971	33-36	B22	9.0	38.2	24.7	62.9			28.1					
16972	36-39	B22	9.5	38.7	24.7	63.4			27.1					
16973	39-42	B22	9.6	38.2	24.1	62.3			28.1					
16974	42-46	B3	8.4	37.4	25.2	62.6			29.0					
16975	46-50	B3	7.5	37.7	26.2	63.9			28.6					
16976	50-56	B3	6.5	37.6	27.7	65.3			28.2					
16977	56-62	B3	7.9	41.3	26.1	67.4			24.7					
16978	62-68	C1	6.5	41.6	27.2	68.8			24.7					
16979	68-78	C1	6.4	42.1	29.0	71.1			22.5					
16980	78-88	C1	4.3	43.4	31.5	74.9			20.8					
16981	88-96	C2	5.4	44.8	32.7	77.5			17.1					
16982	96-108	C2	4.8	47.6	33.5	81.1			14.1					

Lab. no.	Exch. cations me./100g. soil				Exch. Ca / Exch. Mg	Cation exch. cap., me./100g.	Base saturation, %	pH 1:1 ratio	$CaCO_3$ equiv., %	Organic carbon, %	Bulk density	Soil tests lb. per acre		
	Ca	Mg	K	Na								P_1	P_2	K
16961	5.6	1.7			3.3	15.9	46	6.4		.87				
16962	5.1	1.1			4.6	9.4	70	5.8		.23				
16963	6.0	1.9			3.2	11.4	69	5.8		.23				
16964	6.4	2.8			2.3	13.4	69	5.6		.23				
16965	6.9	3.6			1.9	15.6	67	5.3		.17				
16966	7.0	4.0			1.8	18.2	60	4.8		.17				
16967	7.9	4.4			1.8	19.8	62	4.8		.17				
16968	8.7	4.7			1.9	21.1	64	4.8		.12				
16969	9.3	4.8			1.9	21.1	67	4.9		.12				
16970	9.2	4.8			1.9	20.0	70	5.0		.23				
16971	9.7	5.2			1.9	21.0	71	5.0		.23				
16972	9.1	5.0			1.8	20.3	70	5.1		.17				
16973	9.9	5.6			1.8	21.6	72	5.2		.17				
16974	9.9	5.3			1.9	21.3	71	5.3		.17				
16975	10.3	5.8			1.8	21.6	75	5.2		.17				
16976	10.7	6.2			1.7	22.3	76	5.2		.23				
16977	9.4	5.8			1.6	19.7	77	5.3		.12				
16978	9.3	5.8			1.6	19.9	76	5.4		.12				
16979	11.0	6.8			1.6	19.3	92	7.5		.06				
16980	10.0	6.8			1.5	17.4	97	7.9	2.7	.12				
16981	8.6	6.0			1.4	14.6	100	8.1	8.8	.12				
16982	7.3	5.0			1.5	12.3	100	8.2	17.3	.12				

Profile No. 4 — Fayette Silt Loam (280)

Ogle County, T.24N., R.10E., Sec. 9, SE160, SW40, SW10

Sampled in a grazed rotation pasture, near crest of ridge on a 2.5-percent slope to south with a 7-percent slope beginning 50 feet north and a 6-percent slope beginning 150 feet south, 390 feet east of center of road, 155 feet north of section line fence, about 40 miles east to northeast of Mississippi River bluff and one-half mile west from Rock River bluff. Parent material is Peorian loess 6 feet thick, calcareous at a depth of 56 inches. Native vegetation was deciduous forest. Description written and samples collected at site in 1957.

Ap, (0-6"), 18129 -- Dark grayish brown (10YR 4/2) friable silt loam; weak fine to medium crumb or soft granular; roots numerous; abrupt smooth boundary.

A_2, (6-10"), 18130 -- Brown (10YR 4/3) friable silt loam; weak thin to medium platy with few fine distinct (when dry) light brownish gray (10YR 6/2) specks in lower part of horizon; roots numerous; clear smooth boundary.

B_1, (10-16"), 18131 -- Dark brown (10YR 4/3-3/3) slightly firm silty clay loam; moderate fine subangular blocky with common fine distinct light brownish gray (10YR 6/2) specks on surfaces roots numerous; clear smooth boundary.

B_{21}, (16-25"), 18132 -- Dark brown (10YR 3/3) firm silty clay loam, slightly heavier than B_1 layer above; moderate to strong fine to medium subangular blocky with common fine distinct light brownish gray (10YR 6/2) specks on surfaces; roots numerous; clear smooth boundary.

B_{22}, (25-36"), 18133 -- Brown (10YR 4/3) firm silty clay loam; moderate coarse to medium blocky with common medium distinct light brownish gray to light gray (10YR 6/2-7/2) silica coatings and common dark brown (10YR 3/3) clay films; roots common; clear wavy boundary.

B_3, (36-46"), 18134 -- Brown to dark yellowish brown (10YR 4/3-4/4) firm light silty clay loam; weak coarse blocky with few light brownish gray to light gray (10YR 6/2-7/2) discontinuous silica coatings and common dark brown (10YR 3/3) clay films; roots few; clear wavy boundary. Within the horizon was found an old root channel about 2" in diameter with prominent yellowish red (5YR 4/8-5/8) Fe bands or concentrations around periphery with interior nearly filled with brown to grayish brown (10YR 5/3-5/2) silt loam.

C_1, (46-56"), 18135 -- Brown to dark yellowish brown (10YR 4/3-4/4) slightly firm silt loam; many very fine threadlike vesicles or channels; massive; abrupt smooth boundary.

C_2, (56-73"), 18136 -- Yellowish brown (10YR 5/4-5/5) friable silt loam; massive; calcareous.

C_3, (73-81"), Not sampled -- Brown (7.5YR 4/4) friable silt loam; massive; calcareous. Interpreted as Farmdale loess or possibly a mixture of Farmdale and Peoria.

Lab. no.	Depth, in.	Horizon	Particle size distribution of < 2 mm. (in mm.) (%)							Pores		Hydraulic conductivity, in./hr.	Moisture	
			Sand	Silt			Clay			Capillary, %	Non-capillary, %		1/3 atmos., %	15 atmos., %
			Total 2-.050	Coarse .050-.020	Fine .020-.002	Total .050-.002	Coarse .002-.0002	Fine < .0002	Total < .002					
18129	0-6	Ap	3.3	43.2	37.6	80.8	9.2	5.7	14.9				27.6	6.4
18130	6-10	A2	2.1	35.6	35.6	71.2	12.7	12.0	24.7				27.3	9.2
18131	10-16	B1	2.0	31.4	32.9	64.3	14.1	18.1	32.2				30.7	13.4
18132	16-25	B21	1.8	31.8	30.8	62.7	16.1	18.5	34.6				32.7	15.0
18133	25-36	B22	2.0	33.6	32.1	65.7	12.6	18.2	30.8				33.3	13.6
18134	36-46	B3	4.0	39.3	29.2	68.5	8.2	16.8	25.0				31.8	11.1
18135	46-56	C1	5.1	48.3	22.6	70.9	7.1	14.9	22.0				30.9	10.1
18136	56-73	C2	6.7	59.1	23.9	83.0	4.8	3.5	8.3				23.8	4.4

Lab. no.	Exch. cations me./100g. soil				Exch. Ca / Exch. Mg	Cation exch. cap., me./100g.	Base saturation, %	pH 1:1 ratio	$CaCO_3$ equiv., %	Organic carbon, %	Bulk density	Soil tests lb. per acre		
	Ca	Mg	K	Na								P_1	P_2	K
18129	6.9	3.8	.2	.1	1.8	10.6	100+	7.0		1.04		20	63	216
18130	8.2	4.9	.3	.1	1.7	14.1	96	6.4		.43		20	27	185
18131	9.3	6.9	.4	.1	1.3	20.3	82	5.1		.35		52	79	270
18132	9.6	7.8	.4	.1	1.2	23.6	75	4.5		.34		75	107	292
18133	9.2	7.6	.4	.1	1.2	21.8	80	4.9		.21		107	174	270
18134	7.4	6.6	.3	.1	1.1	16.2	91	5.1		.18		101	200	232
18135	8.0	7.1	.2	.1	1.1	14.6	100+	5.9		.17		44	196	176
18136								7.7	33.8	.09		13	200	116

Profile No. 5 — Fayette Silt Loam (280)

Warren County, T.11N., R.3W., Sec. 9, SE160, NE40, NE10

Sampled in roadside of untraveled road on a 6-percent slope to southwest, 31 rods west of creek bridge, 150 feet west from top of steep slope, and approximately 9 miles east of Mississippi River bluff. Parent material was Peorian loess 12½ feet thick, calcareous at 125 inches. Native vegetation was deciduous forest. Samples collected in 1944 and data included in Ill. Agr. Exp. Sta. Bul. 587 (N.C.R. Pub. 46). The following description was written at the same site in 1957.

A_1, (0-2"), 17026 -- Very dark gray to dark gray (10YR 3/1-4/1) very friable silt loam; weak fine crumb; pH 7.4; gradual wavy boundary.

A_2, (2-12"), 17027-9 -- Grayish brown (10YR 5/2) very friable silt loam; weak thin to medium platy with specks of light brownish gray (10YR 6/2); pH 6.2; gradual wavy boundary.

A_3, (12-14"), 17030 -- Dark grayish brown to brown (10YR 4/2-5/3) friable silt loam; weak very fine to medium subangular blocky specked light brownish gray (10YR 6/2); pH 5.2; clear wavy boundary.

B_1, (14-19"), 17031-2 -- Dark grayish brown to brown (10YR 4/2-4/3) friable heavy silt loam to light silty clay loam; moderate fine to medium subangular blocky with discontinuous clay films and specked light brownish gray (10YR 6/2); pH 4.9; clear smooth boundary.

B_{21}, (19-31"), 17033-6 -- Brown (10YR 4/3) firm silty clay loam; strong medium subangular blocky with continuous dark brown (7.5YR 4/3) clay films; pH 4.9; gradual smooth boundary.

B_{22}, (31-40"), 17037-40 -- Yellowish brown (10YR 5/4) firm silty clay loam; strong medium to coarse subangular to angular blocky with continuous clay coatings; pH 5.0; gradual smooth boundary.

B_3, (40-60"), 17041-5 -- Yellowish brown (10YR 5/4) firm light silty clay loam mottled light yellowish brown (10YR 6/4); moderate coarse subangular blocky with few thin patchy brown (10YR 4/3) clay films; pH 5.0; gradual smooth boundary.

C_1, (60-120"), 17046-51 -- Light yellowish brown and yellow (10YR 6/4 and 7/6) friable heavy silt loam; weak coarse subangular blocky fading to massive; pH 5.6 at 60 inches; clear smooth boundary.

C_2, (125-140"), 17052 -- Light yellowish brown to yellow (10YR 6/4-7/6) friable silt loam; massive; calcareous.

Lab. no.	Depth, in.	Horizon	Particle size distribution of < 2 mm. (in mm.) (%)							Pores		Hydraulic conductivity, in./hr.	Moisture	
			Sand	Silt			Clay			Capillary, %	Non-capillary, %		1/3 atmos., %	15 atmos., %
			Total 2-.050	Coarse .050-.020	Fine .020-.002	Total .050-.002	Coarse .002-.0002	Fine < .0002	Total < .002					
17026	0-2	A1	1.4	52.6	28.6	86.2	5.8	6.6	12.4					
17027	2-5	A2	.8	56.4	30.9	87.3	5.1	6.8	11.9					
17028	5-8	A2	.8	55.4	31.9	87.3	4.6	7.3	11.9					
17029	8-12	A2	.8	53.5	31.3	84.8	6.4	8.0	14.4					
17030	12-14	A3	.8	51.5	31.2	82.7	7.8	8.7	16.5					
17031	14-17	B1	.8	47.8	29.2	77.0	7.5	14.7	22.2					
17032	17-19	B1	.8	44.2	28.0	72.2	9.8	17.2	22.0					
17033	19-22	B21	.8	41.6	28.8	70.4	9.7	19.1	28.8					
17034	22-25	B21	1.1	41.3	28.7	20.0	9.7	19.2	28.9					
17035	25-28	B21	1.2	38.4	30.1	68.5	10.6	19.7	30.3					
17036	28-31	B21	.9	41.4	28.8	70.2	9.8	19.1	28.9					
17037	31-33	B22	.9	41.4	29.8	77.2	8.4	19.5	27.9					
17038	33-35	B22	.9	34.2	28.6	71.8	9.3	18.0	27.3					
17039	35-37	B22	.7	42.4	29.8	72.2	8.6	18.5	27.1					
17040	37-40	B22	.9	41.0	29.9	70.9	8.4	19.8	28.2					
17041	40-43	B3	.8	38.7	31.7	70.4	8.7	20.1	28.8					
17042	43-46	B3	.7	38.4	31.5	69.9	10.1	19.3	28.8					
17043	46-50	B3	1.1	43.3	29.7	73.0	8.4	17.5	25.9					
17044	50-55	B3	.7	39.6	33.5	73.1	7.8	18.4	26.2					
17045	55-60	B3	.6	38.5	34.2	72.7	8.2	18.5	26.7					
17046	60-70	C1	.6	40.3	32.5	72.8	8.6	18.0	26.6					
17047	70-80	C1	.8	41.1	31.8	72.9	8.3	18.0	26.3					
17048	80-90	C1	.8	45.8	31.8	77.6	5.8	15.8	21.6					
17049	90-100	C1	.7	49.0	30.1	79.1	4.9	15.3	20.2					
17050	100-110	C1	.9	54.2	25.8	80.0	4.6	14.5	19.1					
17051	110-120	C1	1.3	51.2	28.6	79.8	5.3	13.6	18.9					
17052	125-140	C2	1.0	54.1	29.8	83.9	4.4	10.7	15.1					

Lab. no.	Exch. cations me./100g. soil				Exch. Ca / Exch. Mg	Cation exch. cap., me./100g.	Base saturation, %	pH 1:1 ratio	$CaCO_3$ equiv., %	Organic carbon, %	Bulk density	Soil tests lb. per acre		
	Ca	Mg	K	Na								P_1	P_2	K
17026	28.6	2.7			10.6	19.1	154							
17027	15.4	1.9			8.3	15.4	108	7.1		2.55				
17028	7.9	1.4			5.6	8.8	101	6.9		1.13				
17029	5.6	1.0			5.6	7.2	94	6.1						
17030	5.8	1.4			4.3	8.6	84	6.0		.48				
17031	6.0	2.1			4.9	13.0	61	4.9		.48				
17032	8.5	3.2			2.6	16.6	71	4.9		.46				
17033	9.8	3.8			2.6	18.1	74	4.9		.46				
17034	10.5	4.1			2.6	18.5	78	5.0		.41				
17035	10.8	4.5			2.4	19.9	77	5.1		.38				
17036	10.3	4.2			2.5	20.3	73	4.8		.34				
17037	10.2	4.1			2.5	19.7	73	5.0		.28				
17038	10.0	4.3			2.4	19.2	75	4.9		.30				
17039	10.1	4.5			2.3	18.8	77	5.0		.26				
17040	10.5	4.8			2.2	19.1	80	5.0		.28				
17041	11.3	4.7			2.4	20.1	82	4.6		.25				
17042	11.7	5.0			2.3	20.2	85	5.1		.26				
17043	10.7	4.9			2.2	18.1	86	5.4		.22				
17044	11.2	5.0			2.2	18.8	88	5.3		.23				
17045	10.5	5.8	.33	.20	1.8	19.7	86	5.4		.24				
17046								5.5		.22				
17047	9.7	5.5	.29	.20	1.8	18.1	87	5.7		.20				
17048								5.8		.19				
17049	7.8	5.0	.25	.19	1.6	14.8	90	6.0		.16				
17050								6.1		.14				
17051	7.6	5.2	.22	.20	1.5	13.9	95	6.5		.16				
17052								7.7	1.0	.29				

Profile No. 6 — Fayette Silt Loam (280)

La Salle County, T.34N., R.1E., Sec. 11, NW160, NE40, NE10

Sampled in a grazed bluegrass permanent pasture, on a 5-percent slope to south and about 110 feet from base of slope into drainageway, 120 feet west of half-mile line fence, 200 feet south of roadside fence, about 60 miles east southeast of Mississippi River bluff, 30 miles east southeast from edge of Green River basin, and 12 to 13 miles northeast from the big bend of Illinois River. Parent material is Peorian loess 7½ feet thick, calcareous at a depth of 80 inches. Native vegetation was deciduous forest. On-site description written and samples collected in 1961.

A_1, (0-6"), 18887 -- Very dark grayish brown (10YR 3/2) friable silt loam (same color crushed); moderate fine and medium granular; abundant roots; pH 6.2; clear wavy boundary.

A_{21}, (6-9"), 18888 -- Dark grayish brown (10YR 4/2) friable silt loam (same color crushed); weak thin platy breaking to moderate fine granules; abundant roots; common very dark grayish brown (10YR 3/2) worm channel fillings; pH 5.5; abrupt wavy boundary.

A_{22}, (9-13"), 18889 -- Brown (10YR 4/3-5/3) friable silt loam; weak thin platy breaking to moderate very fine and fine subangular blocky; abundant roots; pH 6.0; abrupt smooth boundary.

B_1, (13-16"), 18890 -- Brown (10YR 4/3-5/3 crushing to 10YR 4/4) friable heavy silt loam; moderate fine subangular blocky with light gray (10YR 7/2) thin patchy silt coatings which disappear on wetting; common roots; pH 6.0; clear wavy boundary.

B_{21}, (16-22"), 18891 -- Dark yellowish brown (10YR 4/4 crushing to 10YR 5/4) firm silty clay loam; moderate very fine and fine subangular blocky with light gray (10YR 7/2) thin discontinuous silt coatings that are not evident upon wetting; common roots; pH 6.0; gradual wavy boundary.

B_{22}, (22-32"), 18892 -- Dark yellowish brown (10YR 4/4 crushing to 10YR 4/4-5/4) firm heavy silty clay loam; moderate medium subangular blocky breaking to moderate fine subangular blocky with dark brown (10YR 4/3) thin continuous clay coatings; common roots; pH 6.0; gradual smooth boundary.

B_{31}, (32-41"), 18893 -- Dark yellowish brown (10YR 4/4 crushing to 10YR 4/4-5/4) firm light silty clay loam; moderate coarse subangular blocky breaking to moderate fine subangular blocky with light gray (10YR 7/2) thin discontinuous silt coatings which disappear on wetting and dark yellowish brown (10YR 4/4) thin discontinuous clay coatings on vertical surfaces; common roots; pH 5.6; diffuse wavy boundary.

B_{32}, (41-60"), 18894-5 -- Yellowish brown (10YR 5/4 crushing to same color) heavy silt loam to light silty clay loam; weak coarse prismatic breaking to moderate coarse and medium subangular blocky with coatings the same as in above horizon; common roots; few black (N 2/0) Fe-Mn concretions; pH 5.6 in upper part to 6.0 in lower part.

Lab. no.	Depth, in.	Horizon	Particle size distribution of < 2 mm. (in mm.) (%)							Pores		Hydraulic conductivity, in./hr.	Moisture	
			Sand	Silt			Clay			Capillary, %	Non-capillary, %		1/3 atmos., %	15 atmos., %
			Total 2-.050	Coarse .050-.020	Fine .020-.002	Total .050-.002	Coarse .002-.0002	Fine < .0002	Total < .002					
18887	0-6	A1	3.6	44.5	37.0	81.5			14.9	38.4	6.8	1.91	30.4	8.0
18888	6-9	A21	2.4	41.6	38.9	80.5			17.1	34.4	8.6	4.10	28.2	7.1
18889	9-13	A22	3.3	37.8	36.2	74.0			22.7				28.2	9.5
18890	13-16	B1	2.0	36.8	33.9	70.7			27.3				30.0	12.9
18891	16-22	B21	3.1	33.9	31.3	65.2			31.7				32.2	15.2
18892	22-32	B22	2.8	36.5	29.4	65.9			31.3	36.2	6.5	2.91	33.8	14.9
18893	32-41	B31	5.7	38.0	28.7	66.7			27.6				33.3	13.2
18894	41-50	B32	3.0	41.0	29.0	70.0			27.0				33.1	11.6
18895	50-60+	B32	2.7	41.9	31.1	73.0			24.3	41.4	5.8	.13	32.7	11.4

Lab. no.	Exch. cations me./100g. soil				Exch. Ca / Exch. Mg	Cation exch. cap., me./100g.	Base saturation, %	pH 1:1 ratio	$CaCO_3$ equiv., %	Organic carbon, %	Bulk density	Soil tests lb. per acre		
	Ca	Mg	K	Na								P_1	P_2	K
18887	7.0	1.6	.4	Tr.	4.4	11.9	76	5.7		1.62	1.31	26	41	300+
18888	6.2	1.4	.4	Tr.	4.4	10.3	78	5.7		.68	1.35	34	53	288
18889	10.1	2.1	.4	.1	4.8	13.4	95	5.7		.44		56	88	265
18890	11.2	3.6	.4	.1	3.1	15.7	97	5.9		.34		86	127	243
18891	13.2	5.1	.5	.1	2.6	19.6	96	5.8		.27		120	187	254
18892	12.3	6.0	.5	.1	2.0	20.1	94	5.8		.21	1.41	143	200+	254
18893	9.9	5.7	.4	.1	1.7	18.0	89	5.6		.16		104	162	233
18894	9.6	6.0	.5	.1	1.6	16.9	96	5.4		.14		93	187	233
18895	9.3	5.9	.4	.1	1.6	16.4	96	5.5		.14	1.43	73	180	216

Profile No. 7 — Rozetta Silt Loam (279)

La Salle County, T.34N., R.1E., Sec. 11, NW160, NE40, NE10

Sampled in a grazed bluegrass permanent pasture, on a 5-percent slope to south and 20 feet from base of slope into drainageway, 125 feet south of roadside fence, 45 feet west of half-mile line fence, about 60 miles east southeast from Mississippi River bluff, 30 miles east southeast from edge of Green River basin, and 12 to 13 miles northeast from the big bend of Illinois River. Parent material is Peorian loess 10 feet thick, calcareous at 100-inch depth. Native vegetation was deciduous forest. On-site description written and samples collected in 1961.

A_1, (0-5"), 18896 -- Very dark grayish brown (10YR 3/2) friable silt loam; moderate fine and medium crumb; lower half of this horizon has worm channels filled with A_2 material; abundant roots; pH 6.0; clear smooth boundary.

A_2, (5-11"), 18897 -- Brown (10YR 4/3-5/3) friable silt loam; weak thin and medium platy breaking to moderate medium granular; numerous worm channels filled with A_1 material; abundant roots; pH 5.9; clear smooth boundary.

B_1, (11-17"), 18898 -- Yellowish brown (10YR 4/4-5/4) friable heavy silt loam; moderate fine subangular blocky; brown to dark brown (10YR 4/3) clay films and faint grainy grayish coatings evident in moist condition; upper 2 inches have worm channels filled with A_1 material; common roots; pH 6.0; clear smooth boundary.

B_{21}, (17-29"), 18899-900 -- Brown to dark brown (10YR 4/3) firm medium silty clay loam; strong medium subangular blocky breaking to strong very fine angular blocky; some grainy grayish coatings evident in moist condition and some brown (7.5YR 4/4) clay films; common roots; pH 5.5; clear smooth boundary.

B_{22}, (29-35"), 18901 -- Yellowish brown (10YR 5/4) firm silty clay loam; common fine faint brown (10YR 5/3) to pale brown (10YR 6/3) and few fine distinct yellowish brown (10YR 5/6 and 5/8) mottles; moderate medium subangular blocky breaking to moderate fine and very fine angular blocky; some silt and clay coatings discontinuous on all surfaces; common fine Fe-Mn concretions; pH 5.4; clear smooth boundary.

B_{23}, (35-40"), 18902 -- Mixed brown (10YR 5/3) to yellowish brown (10YR 5/4), grayish brown (2.5Y 5/2) and light grayish brown (2.5Y 6/2) firm light silty clay loam with many fine distinct yellowish brown (10YR 5/6 and 5/8) mottles; weak to moderate medium and coarse angular blocky; discontinuous clay coatings of brown (10YR to 7.5YR 4/3-4/4) on vertical surfaces; common fine Fe-Mn concretions; pH 5.4; clear smooth boundary.

B_3, (40-47"), 18903 -- Grayish brown (2.5Y 5/2) to light brownish gray (2.5Y 6/2) firm light silty clay loam with many fine distinct yellowish brown (10YR 5/6 and 5/8) mottles; weak coarse subangular and angular blocky with brown (10YR 5/3) to yellowish brown (10YR 5/4) silt coatings and dark brown (7.5YR 4/2) thin to medium clay coatings all discontinuous on vertical surfaces; common fine Fe-Mn concretions; pH 5.5; diffuse smooth boundary.

C_1, (47-66"), 18904-5 -- Grayish brown (2.5Y 5/2) to light brownish gray (2.5Y 6/2) friable heavy silt loam; common fine distinct strong brown (7.5YR 5/6 and 5/8) mottles with horizontal elongation; a few large vertical cleavage faces have dark brown (7.5YR 3/2) patchy thin clay coatings on vertical surfaces; a few worm channels filled with translocated clay; pH 6.7.

Lab. no.	Depth, in.	Horizon	Particle size distribution of < 2 mm. (in mm.) (%) Sand Total 2-.050	Silt Coarse .050-.020	Silt Fine .020-.002	Silt Total .050-.002	Clay Coarse .002-.0002	Clay Fine < .0002	Clay Total < .002	Pores Capillary, %	Pores Noncapillary, %	Hydraulic conductivity, in./hr.	Moisture ⅓ atmos., %	Moisture 15 atmos., %
18896	0-5	A1	3.1	38.6	43.0	81.6			15.3	40.3	8.8	3.92	31.5	9.2
18897	5-11	A2	1.8	38.6	42.3	80.9			17.3	36.5	8.0	3.20	29.9	6.9
18898	11-17	B1	2.4	34.3	39.5	73.8			23.8				30.6	11.4
18899	17-23	B21	2.3	30.9	34.4	65.3			32.4				33.4	14.4
18900	23-29	B21	2.3	34.3	30.8	65.1			32.8	39.8	4.3	1.10	35.6	15.3
18901	29-35	B22	3.3	35.7	30.4	66.1			30.6				35.3	14.7
18902	35-40	B23	3.6	37.5	30.3	67.8			28.6				34.7	13.9
18903	40-47	B3	3.6	38.8	30.1	68.9			27.5				34.8	13.6
18904	47-59	C1	2.7	41.8	29.3	71.1			26.2	42.3	2.7	.18	34.3	13.2
18905	59-66	C1	4.0	40.6	29.8	70.4			25.6				34.1	13.1

Lab. no.	Exch. cations me./100g. soil Ca	Mg	K	Na	Exch. Ca / Exch. Mg	Cation exch. cap., me./100g.	Base saturation, %	pH 1:1 ratio	$CaCO_3$ equiv., %	Organic carbon, %	Bulk density	Soil tests lb. per acre P_1	P_2	K
18896	5.9	1.6	1.2	Tr.	3.7	11.8	74	5.7		2.04	1.22	36	55	300+
18897	4.6	2.0	.7	Tr.	2.3	9.0	81	5.6		.62	1.34	27	48	300+
18898	8.6	3.4	.6	Tr.	2.5	14.0	90	5.7		.26		60	96	300+
18899	11.6	5.8	.6	.1	2.0	18.9	96	5.1		.26		120	180	300
18900	11.4	6.7	.5	.1	1.7	21.2	88	4.8		.23	1.48	130	194	274
18901	10.9	6.7	.5	.1	1.6	19.8	92	4.9		.25		127	187	285
18902	10.8	6.8	.5	.1	1.6	19.2	95	4.9		.17		130	200+	274
18903	11.3	7.0	.4	.1	1.6	19.6	96	5.2		.15		86	200+	234
18904	11.8	7.4	.4	.1	1.6	19.5	101	5.9		.13	1.47	41	200+	200
18905	12.4	7.8	.4	.1	1.6	17.7	117	7.1		.14		28	200+	184

Profile No. 8 — Stronghurst Silt Loam (278)

Ogle County, T.25N., R.8E., Sec. 13, SE160, NE40, NE10

Sampled in ungrazed woodlot, on 2.5-percent slope to southeast, 170 feet west of center of roadway, 65 feet south of half-mile line fence, and about 33 miles east of Mississippi River bluff. Parent material is Peorian loess 6.5 feet thick, including some fine sand between depths of 59 and 78 inches, all noncalcareous. Native vegetation was deciduous forest. On-site description written and samples collected in 1957.

A_1, (0-3"), 18092 -- Very dark brown (10YR 2/2) friable silt loam; moderate fine to medium crumb or soft granular; pH 6.2; clear smooth boundary.

A_{21}, (3-7"), 18093 -- Grayish brown (10YR 5/2-6/2) friable silt loam; moderate thin to medium platy; roots common; few small Fe concretions; few worm burrows; pH 5.0; clear smooth boundary.

A_{22}, (7-12"), 18094 -- Pale brown (10YR 6/3, dry 10YR 7/1-8/2) friable light silt loam; weak medium platy; roots common; Fe-Mn concretions common; worm burrows few; pH 5.0; clear smooth boundary.

A_3-B_1, (12-15"), 18095 -- Brown to yellowish brown (10YR 5/3-5/4) firm heavy silt loam borderline to light silty clay loam; weak fine to medium subangular blocky with distinct coatings of light gray (10YR 7/2-8/2 when dry); roots few; worm burrows few; Fe-Mn concretions of 5YR 3/2 common; pH 5.2; clear smooth boundary.

B_{21}, (15-19"), 18096 -- Brown (10YR 5/3) firm silty clay loam; moderate fine to medium subangular blocky with distinct light gray (10YR 7/2-8/2 dry) coatings; roots few; worm burrows few; Fe-Mn 5YR 3/2 concretions common; pH 5.5; gradual smooth boundary.

B_{22}, (19-23"), 18097 -- Brown (10YR 5/3) firm silty clay loam; moderate fine to medium blocky coated light gray (10YR 7/2 to 8/2 when dry), distinct but less continuous than in above layer; roots few; worm burrows few; Fe-Mn 5YR 3/2 concretions common; pH 5.5; clear smooth boundary.

B_{23}, (23-29"), 18098 -- Light olive brown to light brownish gray (2.5Y 5/4-6/2, 90%) firm silty clay loam mottled (10%) common fine distinct yellowish brown (10YR 5/6-5/8); moderate medium subangular blocky with distinct discontinuous coatings of light gray (10YR 7/2-8/2 dry); roots few; worm burrows few; Fe-Mn 5YR 3/2 concretions common; pH 5.5; clear smooth boundary.

B_3, (29-40"), 18099 -- Yellowish brown to yellow (10YR 5/8-7/6) mottled light brownish gray (2.5Y 6/2) firm light silty clay loam; moderate coarse to very coarse angular blocky to weak coarse prismatic with coatings and crack fillings of dark gray (10YR 4/1) silty clay; roots few; many old channels filled with black (10YR 2/1) material; worm burrows few; Fe-Mn 5YR 3/2 concretions common; pH 5.5; gradual smooth boundary.

C_1, (40-50"), 18100 -- Mixed colors of light brownish gray (2.5Y 6/2), yellowish brown (10YR 5/8) and yellow (10YR 7/6) friable silt loam; numerous fine black (10YR 2/1) filled channels or burrows; massive; pH 6.3; gradual smooth boundary.

C_2, (50-59"), 18101 -- Mixed light brownish gray (2.5Y 6/2) and brownish yellow to yellow (10YR 6/8-7/6) friable silt loam; few fine channels filled with black (10YR 2/1) material; massive; pH 7.8; clear smooth boundary.

C_3, (59-78"), Not sampled -- Fine sandy silt loam, probably loess mixed with fine sand from till below.

Lab. no.	Depth, in.	Horizon	Particle size distribution of < 2 mm. (in mm.) (%)							Pores		Hydraulic conductivity, in./hr.	Moisture	
			Sand	Silt			Clay							
			Total 2-.050	Coarse .050-.020	Fine .020-.002	Total .050-.002	Coarse .002-.0002	Fine < .0002	Total < .002	Capillary, %	Noncapillary, %		⅓ atmos., %	15 atmos., %
18092	0-3	A1	4.1	34.5	43.3	77.8	7.9	8.3	16.2				41.6	15.6
18093	3-7	A21	4.0	36.3	44.6	70.9	7.1	6.6	13.7	39.4	7.2	.17	32.9	6.3
18094	7-12	A22	4.4	34.2	43.1	77.3	9.6	7.7	17.3				30.9	6.7
18095	12-15	A3-B1	3.9	33.1	38.5	71.6	9.8	12.9	22.7				33.2	10.0
18096	15-19	B21	3.4	31.2	34.0	65.2	10.5	19.1	29.6				33.6	13.3
18097	19-23	B22	2.8	32.4	31.0	63.4	14.9	17.9	32.8	41.5	9.9	1.05	38.0	15.2
18098	23-29	B23	3.1	32.7	31.1	63.8	15.0	17.2	32.2				38.1	15.7
18099	29-40	B3	1.9	33.3	36.0	64.3	11.9	21.3	33.2	45.7	4.2	.03	39.1	16.2
18100	40-50	C1	2.3	40.3	32.1	72.4	8.6	16.3	24.9				36.7	12.2
18101	50-59	C2	6.8	38.5	34.5	73.0	8.5	11.6	19.1	39.4	7.6	.18	33.9	9.5

Lab. no.	Exch. cations me./100g. soil				Exch. Ca / Exch. Mg	Cation exch. cap., me./100g.	Base saturation, %	pH 1:1 ratio	$CaCO_3$ equiv., %	Organic carbon, %	Bulk density	Soil tests lb. per acre		
	Ca	Mg	K	Na								P_1	P_2	K
18092	13.5	4.6	.4	.1	2.9	23.5	80	6.0		4.24		48	67	300+
18093	1.6	1.8	.1	.1	.9	11.4	20	4.6		1.04	1.36	32	54	150
18094	3.1	2.8	.1	.1	1.1	11.5	53	4.8		.45		22	29	184
18095	6.0	4.6	.2	.1	1.3	10.7	68	4.9		.40		22	30	216
18096	9.0	7.3	.3	.1	1.2	21.8	72	5.0		.36		30	53	254
18097	10.6	8.0	.4	.1	1.3	25.1	77	4.9		.32	1.36	63	98	296
18098	11.8	6.7	.4	.1	1.8	27.6	79	4.9		.42		79	124	296
18099	12.4	9.5	.3	.1	1.3	26.8	84	5.6		.22	1.43	71	148	296
18100	11.1	8.6	.3	.1	1.3	20.7	99	5.8		.18		26	200+	156
18101	9.3	7.3	.2	.1	1.3	14.7	100	7.1		.13	1.48	26	200+	144

Profile No. 9 — Stronghurst Silt Loam (278)

La Salle County, T.34N., R.1E., Sec. 11, NW160, NE40, NE10

Sampled in grazed permanent bluegrass pasture, on a slope of about 0.5-percent to southeast, 570 feet south of fence along road, 290 feet west of half-mile line fence, and about 60 miles east southeast of Mississippi River bluff, 30 miles east southeast from edge of Green River basin, and 12 to 13 miles northeast from the big bend of the Illinois River. Parent material is Peorian loess 6½ feet thick, calcareous at a depth of 46 inches. Native vegetation was deciduous forest. On-site description written and samples collected in 1961.

A_1, (0-4"), 18924 -- Very dark grayish brown (10YR 3/2) friable silt loam; moderate fine and medium crumb; abundant roots; few worm channels filled with A_2 material in lower part; pH 6.0; clear smooth boundary.

A_2, (4-9"), 18925 -- Grayish brown (10YR 5/2) friable silt loam; moderate medium platy breaking to weak fine subangular blocky; common roots; many worm channels filled with A_1 material; pH 5.3; clear smooth boundary.

B_1, (9-14"), 18926 -- Brown (10YR 5/3) firm light silty clay loam; few fine faint yellowish brown (10YR 5/4) mottles; moderate very fine and fine subangular blocky; brown (10YR 5/3) very thin continuous clay coatings and light brownish gray (10YR 6/2) thin patchy silt coatings; common roots; occasional black (N 2/0) Fe-Mn concretions; occasional worm channels filled with A_1 material; pH 5.5; clear smooth boundary.

B_{21}, (14-22"), 18927 -- Grayish brown to brown (10YR 5/2-5/3) crushing to 10YR 5/4) firm silty clay loam; few fine faint yellowish brown (10YR 5/4 and 5/6) mottles; moderate fine angular and subangular blocky with dark grayish brown (10YR 4/2) thin shiny continuous clay coatings; occasional roots; occasional Fe-Mn concretions; pH 5.5; clear smooth boundary.

B_{22}, (22-29"), 18928 -- Grayish brown (2.5Y 5/2 crushing to 10YR 5/3) firm medium silty clay loam; many fine distinct yellowish brown (10YR 5/6 and 5/4), light brownish gray (2.5Y 6/2) and dark grayish brown (2.5Y 4/2) mottles; moderate fine and medium angular blocky with dark grayish brown (10YR 4/2) thin shiny continuous clay coatings; common fine black (N 2/0) Fe-Mn concretions; occasional roots; pH 6.0; diffuse smooth boundary.

B_{23}, (29-40"), 18929 -- Mixed light brownish gray (2.5Y 6/2) and grayish brown (2.5Y 5/2) firm medium silty clay loam with many fine distinct yellowish brown (10YR 5/6 and 5/8) and dark grayish brown (10YR 4/2) mottles; weak medium prismatic breaking to moderate medium and coarse angular blocky with grayish brown (10YR 5/2) and dark grayish brown (10YR 4/2) thin shiny continuous clay coatings, thickest on vertical faces; many fine black (N 2/0) Fe-Mn concretions; occasional roots; pH 7.0; clear smooth boundary.

C_1, (40-46"), 18930 -- Mixed grayish brown (2.5Y 5/2) and yellowish brown (10YR 5/6 and 5/8) friable heavy silt loam; occasional vertical cleavage planes with grayish brown (2.5Y 5/2) thin shiny clay coatings; many fine black (N 2/0) Fe-Mn concretions; occasional roots; pH 8.0; diffuse smooth boundary.

C_2, (46-66"), 18931 -- Mixed yellowish brown (10YR 5/4 and 5/6) and light brownish gray (10YR 6/2) friable light silt loam; massive; common fine black (N 2/0) Fe-Mn concretions; an occasional calcium carbonate concretion; calcareous.

Lab. no.	Depth, in.	Horizon	Particle size distribution of < 2 mm. (in mm.) (%) Sand Total 2-.050	Silt Coarse .050-.020	Silt Fine .020-.002	Silt Total .050-.002	Clay Coarse .002-.0002	Clay Fine < .0002	Clay Total < .002	Pores Capillary, %	Pores Non-capillary, %	Hydraulic conductivity, in./hr.	Moisture ⅓ atmos., %	Moisture 15 atmos., %
18924	0-4	A1	4.0	36.6	44.4	81.0			15.0	43.2	6.4	.43	33.2	8.5
18925	4-9	A2	3.2	36.9	42.4	79.3			17.5	38.3	6.4	1.24	30.0	7.2
18926	9-14	B1	3.4	31.6	36.9	68.5			28.1				31.2	12.6
18927	14-22	B21	2.9	28.4	31.7	60.1			37.0				36.0	17.9
18928	22-29	B22	2.7	36.6	29.0	65.6			31.7	41.2	3.9	.50	36.2	18.0
18929	29-40	B23	3.5	35.9	30.3	66.2			30.3				35.4	17.1
18930	40-46	C1	4.6	38.6	31.8	70.4			25.0				34.3	14.3
18931	46-66	C2	8.8	51.0	29.3	80.3			10.9	39.4	5.5	.88	27.2	6.3

Lab. no.	Exch. cations me./100g. soil Ca	Mg	K	Na	Exch. Ca / Exch. Mg	Cation exch. cap., me./100g.	Base saturation, %	pH 1:1 ratio	$CaCO_3$ equiv., %	Organic carbon, %	Bulk density	Soil tests lb. per acre P_1	P_2	K
18924	6.8	1.8	.5	Tr.	3.8	13.4	68	5.4		2.17	1.33	12	15	300+
18925	5.6	1.7	.4	Tr.	3.3	10.6	73	5.2		.58	1.38	10	13	296
18926	11.1	4.8	.5	.1	2.3	17.8	93	4.7		.46		14	20	285
18927	16.1	8.8	.7	.1	1.8	28.5	90	4.8		.39		28	42	296
18928	14.6	8.8	.6	.1	1.6	24.0	100	5.4		.29	1.51	35	69	234
18929	15.6	9.1	.6	.1	1.7	24.0	106	6.4		.22		13	187	184
18930			.4	.1		21.7		7.4	1.0	.18		11	200+	184
18931			.2	.1		8.5		7.9	24.0	.13	1.50	6	168	132

Profile No. 10 — Stronghurst Silt Loam (278)

Henderson County, T.9N., R.4W., Sec. 12, SW160, NE40, NE10

Sampled in ungrazed woods on 0-percent slope, 500 feet south of lane gate or 315 feet north of gateway into woods, 130 feet west from center of road, and about 10 miles east southeast of Mississippi River bluff. Parent material is Peorian loess 12 feet thick, calcareous at a depth of 66 inches. Native vegetation is deciduous forest. On-site description written and samples collected in 1964.

A_1, (0-3"), 19465 -- Very dark gray (10YR 3/1) friable silt loam; weak fine to very fine crumb; mildly alkaline to neutral; abundant tree roots; few to many worm channels; abrupt smooth boundary.

A_{21}, (3-6"), 19466 -- Dark gray (10YR 4/1) friable silt loam; moderate thin to very thin platy with light gray (10YR 7/1) dull thin patchy silt coatings; strongly acid; abundant tree roots; few to many worm channels; clear smooth boundary.

A_{22}, (6-13"), 19467 -- Grayish brown (10YR 5/2) friable silt loam; weak thin to medium platy in upper part to weak fine subangular blocky in lower part; light gray (10YR 7/1) dull thin patchy silt coatings; strongly acid; few fine Fe-Mn concretions; few worm channels; abrupt smooth boundary.

B_1, (13-20"), 19468 -- Dark grayish brown (10YR 4/2) friable heavy silt loam in upper part to firm light silty clay loam in lower part; few fine faint dark yellowish brown (10YR 4/4) mottles; moderate fine subangular blocky with light gray (10YR 7/1) dull thin continuous silt coatings; very strongly acid; common fine black (10YR 2/1) to very dark gray (10YR 3/1) Fe-Mn concretions; few unfilled coated worm channels; abrupt smooth boundary.

B_{21}, (20-27"), 19469 -- Grayish brown (10YR 5/2) to brown (10YR 5/3) firm medium to heavy silty clay loam with few fine faint yellowish brown (10YR 5/8 and 5/6) mottles; weak medium prismatic breaking to moderate fine to medium subangular and angular blocky with dark gray (10YR 4/1) and very dark gray (10YR 3/1) dull thin discontinuous clay-organic coatings and light gray (10YR 7/1) dull thin patchy silt coatings; strongly acid; common fine black (10YR 2/1) and very dark gray (10YR 3/1) Fe-Mn concretions; some unfilled coated worm channels; clear smooth boundary.

B_{22}, (27-33"), 19470 -- Mixed yellowish brown (10YR 5/6 and 5/8), brown (7.5YR 4/4) and light brownish gray (2.5Y 6/2) firm heavy silty clay loam; weak medium prismatic breaking to moderate medium subangular and angular blocky with very dark gray (10YR 3/1) and dark gray (10YR 4/1) shiny moderately thick discontinuous clay-organic coatings; strongly acid; few Fe-Mn concretions; few unfilled coated worm channels; gradual smooth boundary.

B_{23}, (33-43"), 19471 -- Mixed grayish brown (2.5Y 5/2), light brownish gray (2.5Y 6/2), yellowish brown (10YR 5/6-5/8) and brown (7.5YR 4/4) firm medium silty clay loam; weak coarse angular blocky with very dark gray (10YR 3/1) and dark gray (10YR 4/1) shiny moderately thick continuous clay-organic coatings; neutral; many black (10YR 2/1) and very dark brown (10YR 2/2) Fe-Mn concretions; few unfilled coated worm channels; gradual smooth boundary.

B31, (43-49"), 19472 -- Mixed light brownish gray (2.5Y 6/2) and yellowish brown (10YR 5/6 and 5/8) firm heavy silt loam to light silty clay loam; very weak angular blocky with black (10YR 2/1) and very dark gray (10YR 3/1) shiny moderately thick discontinuous organic coatings on vertical faces; moderately alkaline; few Fe-Mn concretions; a very occasional lime concretion; few unfilled coated worm channels; gradual smooth boundary.

B_{32}, (49-56"), 19473 -- Light brownish gray (2.5Y 6/2) friable heavy silt loam with many fine to medium distinct yellowish brown (10YR 5/6 and 5/8) mottles; very weak very coarse angular blocky with very dark gray (10YR 3/1) shiny thin discontinuous clay-organic coatings on vertical faces; moderately alkaline; few Fe-Mn concretions; a very occasional lime concretion; few unfilled coated worm channels; diffuse smooth boundary.

C_1, (56-66"), 19474 -- Light brownish gray (2.5Y 6/2) friable silt loam with many medium distinct yellowish brown (10YR 5/6 and 5/8) mottles; massive; very dark gray (10YR 3/1) thin shiny patchy clay-organic coatings along root channels; moderately alkaline; many fine Fe-Mn concretions; diffuse smooth boundary.

C_2, (66-80"), 19475 -- Light brownish gray (2.5Y 6/2) friable silt loam with many medium distinct yellowish brown (10YR 5/6) mottles; massive; calcareous; many Fe-Mn concretions; diffuse smooth boundary.

C_3, (80-100"), 19476 -- Light brownish gray (2.5Y 6/2) friable silt loam with few fine distinct yellowish brown (10YR 5/6 and 5/8) mottles; massive; calcareous; lighter textured than layer below; diffuse smooth boundary.

C_4, (100-140"), Not sampled -- Light gray (5Y 6/1) to light olive gray (5Y 6/2) firm heavy silt loam with few fine distinct yellowish brown (10YR 5/6 and 5/8) mottles; massive; calcareous; heavier textured than layer above; gradual smooth boundary to Sangamon soil in Illinoian till below.

Lab. no.	Depth, in.	Horizon	Particle size distribution of < 2 mm. (in mm.) (%) Sand Total 2-.050	Silt Coarse .050-.020	Silt Fine .020-.002	Silt Total .050-.002	Clay Coarse .002-.0002	Clay Fine < .0002	Clay Total < .002	Pores Capillary, %	Pores Non-capillary, %	Hydraulic conductivity, in./hr.	Moisture 1/3 atmos., %	Moisture 15 atmos., %
19465	0-3	A1	3.5	43.7	36.9	80.6	7.3	8.6	15.9					
19466	3-6	A21	3.1	46.4	35.6	82.0	6.0	8.9	14.9					
19467	6-13	A22	3.4	44.7	36.3	81.0	7.1	8.5	15.6					
19468	13-20	B1	3.4	40.3	31.6	71.9	9.8	14.9	24.7					
19469	20-27	B21	3.0	35.7	26.5	62.2	14.0	20.8	34.8					
19470	27-33	B22	3.4	30.6	29.9	60.5	15.8	20.3	36.1					
19471	33-43	B23	2.7	29.9	32.6	62.5	13.7	21.1	34.8					
19472	43-49	B31	2.9	35.6	31.9	67.5	12.1	17.5	29.6					
19473	49-56	B32	2.6	33.9	36.7	70.6	11.6	15.2	26.8					
19474	56-66	C1	2.4	37.2	36.1	73.3	10.6	13.7	24.3					
19475	66-80	C2	2.5	42.0	36.7	78.7	9.2	9.6	18.8					
19476	80-100	C3	3.3	43.4	35.0	78.4	7.7	10.6	18.3					

Lab. no.	Exch. cations me./100g. soil Ca	Mg	K	Na	Exch. Ca / Exch. Mg	Cation exch. cap., me./100g.	Base saturation, %	pH 1:1 ratio	$CaCO_3$ equiv., %	Organic carbon, %	Bulk density	Soil tests lb. per acre P_1	P_2	K
19465	18.4	3.4	.55	.10	5.5	22.4	100+	6.7		3.56		43	82	300+
19466	5.6	1.8	.33	.07	3.1	12.5	63	5.6		1.39		60	92	266
19467	1.6	.9	.17	.08	1.9	9.9	28	4.5		.41		22	67	120
19468	4.6	3.6	.29	.14	1.3	16.7	52	4.7		.48		19	35	200
19469	10.1	8.0	.44	.31	1.3	26.9	70	4.7		.38		24	49	278
19470	13.0	10.2	.47	.50	1.3	28.5	85	5.1		.29		39	79	278
19471	14.7	11.6	.48	.82	1.3	28.3	97	6.3		.22		38	104	216
19472	15.1	11.3	.36	.95	1.3	25.5	100+	7.6	2.0	.18		35	135+	156
19473	13.3	11.4	.33	1.14	1.2	23.8	100+	7.7	1.0	.17		35	135+	132
19474	11.4	11.0	.29	1.16	1.0	21.2	100+	7.8	1.0	.13		20	135+	138
19475								8.0	13.0	.12		5	135+	120
19476								8.0	13.0			5	135+	99

Profile No. 11 — Traer Silt Loam (633)

La Salle County, T.34N., R.1E., Sec. 11, NW160, NE40, NE10

Sampled in grazed permanent bluegrass pasture on 1.5-percent slope to west, 210 feet south of gravel road, 65 feet west of half-mile line fence, 35 feet south of shallow drainageway, about 60 miles east southeast from Mississippi River bluff, 30 miles east southeast from east edge of Green River basin, and 12 to 13 miles northeast from the big bend of Illinois River. Parent material is Peorian loess 9½ feet thick, calcareous at a depth of 69 inches. Native vegetation was deciduous forest. On-site description written and samples collected in 1961.

A_1, (0-5"), 18906 -- Very dark gray (10YR 3/1, crushed 10YR 3/2) friable silt loam; weak thin platy combined with moderate fine crumb; abundant roots; worm burrows in lower part of horizon filled with A_2 material; pH 6.0; abrupt smooth boundary.

A_2, (5-14"), 18907 -- Grayish brown (2.5Y 5/2, crushed 10YR 6/2) friable silt loam; dark brown around old root channels; moderate thin to very thin platy; abundant roots; common fine Fe-Mn concretions; worm burrows filled with A_1 material; pH 5.5; clear smooth boundary.

B_1, (14-18"), 18908 -- Grayish brown (2.5Y 5/2) friable light silty clay loam; moderate fine subangular blocky with light gray (10YR 7/1 dry) discontinuous silt coatings and dark gray (10YR 4/1) discontinuous clay films; abundant roots; few worm burrows filled with A_1 material; pH 5.3; abrupt smooth boundary.

B_{21}, (18-23"), 18909 -- Dark gray (2.5Y 4/1) firm heavy silty clay loam; moderate fine and very fine angular blocky with very dark gray to dark gray (10YR 3/1-4/1) continuous clay coatings; roots common; pH 5.3; gradual smooth boundary.

B_{22}, (23-28"), 18910 -- Olive gray (5Y 5/2) firm heavy silty clay loam with few fine distinct yellowish brown (10YR 5/6 and 5/8) mottles; moderate fine to very fine angular blocky with dark gray (2.5Y 4/1) continuous clay films; roots common; pH 5.5; gradual smooth boundary.

B_{23}, (28-36"), 18911 -- Olive gray (5Y 5/2) firm medium to heavy silty clay loam with few fine distinct yellowish brown (10YR 5/6 and 5/8) mottles; moderate medium angular blocky with dark gray (10YR 4/1) continuous clay films; few roots; pH 6.0; gradual smooth boundary.

B_{24}, (36-46"), 18912 -- Olive gray (5Y 5/2) firm silty clay loam with common fine distinct dark yellowish brown to yellowish brown (10YR 4/3-5/8) mottles; weak medium prismatic breaks to weak coarse angular blocky with dark gray (2.5Y 4/1) discontinuous clay coatings; roots few; pH 7.0; gradual wavy boundary.

C_1, (46-53"), 18913 -- Olive gray (5Y 5/2) friable heavy silt loam with common fine distinct strong brown (7.5YR 5/6 and 5/8) mottles; nearly massive but with vertical cleavage planes 3-6 inches apart showing very dark gray to dark gray (2.5Y 3/1-4/1) discontinuous clay films; many fine pores filled with dark material; pH 7.2; gradual smooth boundary.

C_2, (53-62"), 18914 -- Similar to above except slightly more mottled, fewer and thinner clay coatings and fewer fine pores filled with dark material.

Note: A krotovina beginning in the B_{23} horizon, continued deeper than 62 inches, had fine brown mottles, and had structure similar to that of surrounding horizons.

Lab. no.	Depth, in.	Horizon	Particle size distribution of < 2 mm. (in mm.) (%)							Pores		Hydraulic conductivity, in./hr.	Moisture	
			Sand	Silt			Clay							
			Total 2-.050	Coarse .050-.020	Fine .020-.002	Total .050-.002	Coarse .002-.0002	Fine < .0002	Total < .002	Capillary, %	Noncapillary, %		1/3 atmos., %	15 atmos., %
18906	0-5	A1	2.5	31.1	49.7	80.8			16.7	42.6	6.5	4.50	35.2	10.4
18907	5-14	A2	2.5	35.1	44.5	79.6			17.9	36.3	5.8	2.25	29.1	7.1
18908	14-18	B1	1.5	30.0	38.7	68.7			29.8				32.1	12.4
18909	18-23	B21	1.2	27.0	32.2	59.2			39.6				36.9	18.2
18910	23-28	B22	.9	28.2	31.1	59.3			39.8	42.6	3.3	.18	38.4	19.9
18911	28-36	B23	1.5	27.7	32.6	60.3			38.2				38.2	19.5
18912	36-46	B24	3.2	32.1	29.7	61.8			35.0				37.5	20.4
18913	46-53	C1	2.8	39.2	29.7	68.9			28.3	43.1	2.3	0	35.3	15.1
18914	53-62	C2	4.6	38.6	31.6	70.2			25.2				32.9	16.8

Lab. no.	Exch. cations me./100g. soil				Exch. Ca / Exch. Mg	Cation exch. cap., me./100g.	Base saturation, %	pH 1:1 ratio	$CaCO_3$ equiv., %	Organic carbon, %	Bulk density	Soil tests lb. per acre		
	Ca	Mg	K	Na								P_1	P_2	K
18906	6.8	1.8	.4	Tr.	3.8	13.0	69	5.6		2.30	1.26	16	27	300+
18907	4.7	1.7	.3	Tr.	2.8	9.6	70	5.0		.35	1.44	38	73	216
18908	9.7	4.8	.5	.1	2.0	18.3	82	4.6		.25		84	152	254
18909	14.3	8.2	.6	.1	1.7	27.1	86	4.6		.37		96	187	296
18910	16.0	10.0	.7	.2	1.6	28.7	94	4.8		.30	1.46	104	152	300+
18911	17.2	10.7	.6	.2	1.6	28.8	100	5.1		.25		86	200+	274
18912	17.6	10.9	.5	.2	1.6	26.8	109	6.3		.22		53	200+	234
18913	15.0	8.8	.4	.1	1.7	22.5	108	6.9		.22	1.49	45	200+	216
18914			.4	.1	1.7	19.8		7.3	1.0	.18		56	200+	216

Profile No. 12 — Clary Silt Loam (283)

Tazewell County, T.25N., R.2W., Sec. 34, NE160, SE40, NE10

Sampled in ungrazed brushy woods, on the crest of a 100-foot wide northwest-southeast trending ridge sloping 2 percent northeast and southwest and 1 percent southeast from sampling site, about 320 feet westerly on road from culvert thence 270 feet northwest, 13½ miles southeast from Illinois River bluff. Parent material is Peorian loess 6½ feet thick, all noncalcareous. Native vegetation is deciduous forest. On-site description written and samples collected in 1958.

A_1, (0-3"), 18169 -- Dark gray (10YR 3/1-4/1) friable silt loam; weak fine granular; common fibrous and woody roots; pH 7.0; abrupt smooth boundary.

A_{21}, (3-7"), 18170 -- Brown (10YR 5/3) friable silt loam; moderate thin platy; some worm holes filled and some partly filled with A_1 material; fibrous and woody roots common; pH 5.0; clear smooth boundary.

A_{22}, (7-11"), 18171 -- Yellowish brown (10YR 5/4) friable silt loam; weak medium platy; occasional fibrous roots; common woody roots; some filled and some unfilled worm channels; pH 5.0; clear smooth boundary.

B_1, (11-13"), 18172 -- Yellowish brown (10YR 5/4) friable light silty clay loam; weak very fine subangular blocky with very thin patchy light brownish gray (10YR 6/2) silt coatings; common woody roots; fibrous roots occasional; occasional unfilled worm channels; pH 5.0; clear smooth boundary.

B_{21}, (13-19"), 18173 -- Yellowish brown (10YR 5/5) firm silty clay loam; moderate fine subangular blocky with thin patchy light brownish gray (10YR 6/2) silt coatings; occasional fibrous roots, common woody roots; occasional unfilled worm hole; pH 5.0; clear smooth boundary.

B_{22}, (19-25"), 18174 -- Yellowish brown (10YR 5/5) firm silty clay loam; moderate medium subangular blocky with very thin discontinuous brown (10YR 4/3) clay films; occasional fibrous and woody roots; occasional unfilled worm channel; pH 5.5; gradual smooth boundary.

B_{23}, (25-31"), 18175 -- Yellowish brown (10YR 5/5) firm silty clay loam; weak fine prismatic breaking to moderate medium subangular blocky; very thin discontinuous clay films of brown (10YR 4/3-5/3) occasional fibrous and woody roots; occasional unfilled worm hole; occasional very dark gray (10YR 3/1) splotches; few fine Fe-Mn concretions; pH 5.5; clear smooth boundary.

B_{24}, (31-39"), 18176 -- Yellowish brown (10YR 5/5) firm silty clay loam; weak to moderate medium prismatic breaking to moderate medium subangular blocky; thin to medium discontinuous clay films of brown (10YR 4/3-5/3) occasional fibrous and woody roots; occasional unfilled worm holes; occasional very dark gray (10YR 3/1) splotches more frequent than in B_{23}; few fine Fe-Mn concretions; pH 5.5; clear smooth boundary.

B_3, (39-49"), 18177 -- Yellowish brown (10YR 5/4) firm light silty clay loam; weak coarse to very coarse subangular blocky; thin discontinuous clay films of dark brown (10YR 4/3) and very pale brown (10YR 7/3) silt coatings; occasional small woody roots; occasional unfilled worm holes; few fine Fe-Mn concretions; pH 5.5; gradual smooth boundary.

C_1, (49-58"), 18178 -- Yellowish brown (10YR 5/4) friable light silty clay loam; weak very coarse subangular blocky; very thin discontinuous clay films of brown (7.5YR 5/4) and occasional very pale brown (10YR 7/3) silt coatings; occasional woody root; occasional chunks of light brownish gray (10YR 6/2) silty material surrounded by yellowish brown (10YR 5/8) Fe-Mn concretional material; pH 5.5; gradual smooth boundary.

C_2, (58-80"), 18179 -- Yellowish brown (10YR 5/4) friable light silty clay loam; almost massive but with some planes of weakness; occasional woody root; pH 6.0; abrupt wavy boundary to loam textured calcareous drift.

Lab. no.	Depth, in.	Horizon	Particle size distribution of < 2 mm. (in mm.) (%)							Pores		Hydraulic conductivity, in./hr.	Moisture	
			Sand	Silt			Clay			Capillary, %	Noncapillary, %		⅓ atmos., %	15 atmos., %
			Total 2-.050	Coarse .050-.020	Fine .020-.002	Total .050-.002	Coarse .002-.0002	Fine < .0002	Total < .002					
18169	0-3	A1	2.5	29.7	51.3	81.0	10.3	4.7	15.0				39.5	10.0
18170	3-7	A21	1.6	30.8	51.4	82.2	9.0	6.1	15.1				28.7	5.5
18171	7-11	A22	1.2	25.9	48.6	74.5	11.9	11.2	23.1				29.6	8.5
18172	11-13	B1	.9	24.5	45.2	69.7	13.8	15.0	28.8				30.8	11.6
18173	13-19	B21	.8	21.9	42.5	64.4	14.9	20.2	35.1				32.9	15.1
18174	19-25	B22	.9	23.5	38.0	61.5	14.0	22.9	36.9				36.5	16.4
18175	25-31	B23	.8	24.3	38.9	63.2	11.2	23.8	35.0				35.7	16.0
18176	31-39	B24	.8	27.7	38.1	65.8	11.5	20.0	31.5				35.0	14.7
18177	39-49	B3	.9	31.0	37.0	68.0	10.7	17.9	28.6				34.0	13.3
18178	49-58	C1	.7	30.9	40.1	71.0	10.9	16.9	27.8				34.0	12.6
18179	58-80	C2	2.7	30.4	38.5	68.9	10.2	17.6	27.8				33.2	12.7

Lab. no.	Exch. cations me./100g. soil				Exch. Ca / Exch. Mg	Cation exch. cap., me./100g.	Base saturation, %	pH 1:1 ratio	$CaCO_3$ equiv., %	Organic carbon, %	Bulk density	Soil tests lb. per acre		
	Ca	Mg	K	Na								P_1	P_2	K
18169	8.0	3.3	.4	.1	2.4	12.5	95	5.9		2.61		38	54	300+
18170	2.2	1.9	.1	.1	1.2	6.2	70	4.9		.55		40	55	200
18171	4.6	4.1	.2	.1	1.1	10.1	90	5.1		.40		34	48	208
18172	7.1	4.8	.3	.1	1.5	14.3	87	5.1		.41		32	54	232
18173	9.5	6.1	.3	.1	1.6	19.0	85	5.2		.38		67	101	270
18174	10.5	7.3	.4	.1	1.4	21.3	87	5.0		.33		56	87	270
18175	10.6	6.9	.4	.1	1.5	19.2	95	5.0		.27		56	91	250
18176	9.7	7.4	.3	.1	1.3	20.8	85	5.1		.23		54	85	250
18177	8.9	6.2	.3	.1	1.4	17.5	91	5.1		.18		57	91	232
18178	8.2	6.3	.3	.1	1.3	16.4	93	5.2		.16		52	79	216
18179	8.5	7.3	.3	.1	1.2	17.1	96	5.1		.20		59	101	208

Profile No. 13 — Clary Silt Loam (283)

Woodford County, T.27N., R.3W., Sec. 8, SE160, SW40, SW10

Sampled in grazed woodland pasture, on 7-percent slope to north with a 10-percent slope beginning 15 feet north of sampling site, 200 feet east of half-mile line fence, 30 feet north of road fence, and 1½ miles east from Illinois River bluff. Parent material is Peorian loess eight feet thick, calcareous at a depth of 58 inches. Native vegetation was deciduous forest. Onsite description written and samples taken in 1958.

A_1, (0-3"), 18200 -- Very dark grayish brown (10YR 3/2) friable silt loam; weak medium platy breaking to weak fine crumb; abundant fibrous roots; worm holes filled with A_2 material; pH 6.0; clear irregular boundary.

A_2, (3-7"), 18201 -- Grayish brown (10YR 4/2-5/2) friable silt loam; weak medium platy breaking to weak fine crumb; fibrous roots common; worm holes filled with A_1 material; occasional 2 mm. Fe-Mn concretions; pH 6.0; clear smooth boundary.

A_3, (7-10"), 18202 -- Brown (10YR 4/3-5/3) friable silt loam; weak medium to coarse granular; fibrous roots common; worm holes filled and partially filled with A_1 material; one small krotovina; pH 6.5; clear smooth boundary.

B_1, (10-13"), 18203 -- Yellowish brown (10YR 5/4) firm light silty clay loam; moderate very fine subangular blocky; fibrous roots common; small rotted woody roots; old worm holes filled and partially filled with dark material from A_1; pH 6.5; clear smooth boundary.

B_{21}, (13-18"), 18204 -- Yellowish brown (10YR 5/5) firm silty clay loam; moderate fine subangular blocky; very thin discontinuous clay films and occasional areas of light gray (10YR 7/2) silt coatings; fibrous roots common; occasional partially rotted woody root; very occasional soft Fe-Mn concretion; occasional worm channel filled with dark A_1 material; old tree root channel 1 inch in diameter filled with yellowish brown (10YR 5/4) silty material; pH 5.5; clear smooth boundary.

B_{22}, (18-24"), 18205 -- Yellowish brown (10YR 5/4) firm silty clay loam; weak medium prismatic breaking to moderate medium subangular blocky; thin discontinuous brown (10YR 4/3) clay films and areas of light gray (10YR 7/2) silt coatings; fibrous roots common; occasional small partially rotted woody root; pH 4.5; clear smooth boundary.

B_{23}, (24-31"), 18206 -- Yellowish brown (10YR 5/4) firm silty clay loam; weak medium prismatic breaking to moderate coarse subangular blocky; thin continuous brown (7.5YR 4/3) clay films; silty coatings as in horizon above but less frequent; fibrous roots common; common small rotted woody roots; old root channels filled with light gray (10YR 7/1 and 7/2) silty material and partially surrounded by reddish brown (5YR 4/4) Fe-stained silty material; common very fine Fe-Mn concretions; pH 5.0; gradual smooth boundary.

B_{24}, (31-40"), 18207 -- Yellowish brown (10YR 5/4) firm light silty clay loam; moderate coarse prismatic breaking to moderate coarse subangular blocky; thin continuous brown (7.5YR 4/3) clay films; light gray silt coatings less frequent than in horizon above; black (10YR 2/1) patchy coatings; occasional fibrous roots and occasional partially rotted woody root; an occasional old root channel filled with light brownish gray (10YR 6/2) silty material partially surrounded by yellowish brown (10YR 5/8) Fe staining; pH 5.0; gradual smooth boundary.

B_3, (40-54"), 18208 -- Yellowish brown (10YR 5/5) moderately firm heavy silt loam; weak coarse to very coarse prismatic breaking to weak very coarse angular blocky; thin discontinuous brown (7.5YR 4/3) clay films; weakly brittle and possible weak fragipan; an occasional fine woody and fibrous root; some small and medium worm holes filled with light gray silty material; abundant very fine black (10YR 2/1) Fe-Mn concretions; pH 6.0; gradual smooth boundary.

C_1, (54-58"), 18209 -- Mixed yellowish brown (10YR 5/4) and light yellowish brown (10YR 6/4) friable silt loam; massive; an occasional fine woody root; an occasional old woody root channel filled with light gray silty material partially surrounded by Fe staining; abundant fine to medium Fe-Mn concretions; clear smooth boundary.

C_2, (58-95"), 18210 -- Yellowish brown (10YR 5/4-6/4) friable silt loam; common fine distinct light brownish gray (10YR 6/2), gray (10YR 5/1) and yellowish brown (10YR 5/6 and 5/8) mottles; massive; calcareous; a few woody roots extend into the upper part of this horizon; many fine Fe-Mn concretions; abrupt wavy boundary to calcareous pinkish loam till below.

Lab. no.	Depth, in.	Horizon	Particle size distribution of < 2 mm. (in mm.) (%)							Pores		Hydraulic conductivity, in./hr.	Moisture	
			Sand	Silt			Clay							
			Total 2-.050	Coarse .050-.020	Fine .020-.002	Total .050-.002	Coarse .002-.0002	Fine < .0002	Total < .002	Capillary, %	Non-capillary, %		1/3 atmos., %	15 atmos., %
18200	0-3	A1	3.4	33.0	47.3	80.3	10.0	5.1	15.1				33.3	8.1
18201	3-7	A2	2.2	33.9	46.6	80.5	11.0	5.7	16.7	36.9	7.6	.60	29.0	6.0
18202	7-10	A3	2.0	29.5	45.2	74.7	11.9	10.8	22.7				29.0	8.4
18203	10-13	B1	1.8	26.8	41.9	68.7	14.2	14.0	28.2				30.4	11.2
18204	13-18	B21	1.9	25.4	39.0	64.4	14.5	18.6	33.1	36.6	7.0	1.09	31.9	13.9
18205	18-24	B22	2.2	26.9	34.4	61.3	13.7	22.9	36.6				34.8	16.5
18206	24-31	B23	3.0	29.6	32.7	62.3	11.3	22.5	33.8				35.5	15.7
18207	31-40	B24	4.6	34.7	29.5	64.2	9.9	19.4	29.3	38.2	4.2	.11	34.2	13.8
18208	40-54	B3	11.1	38.1	25.5	63.6	8.6	15.2	23.8	37.9	4.3	.96	31.3	11.3
18209	54-58	C1	9.3	40.5	26.5	67.0	7.4	14.5	21.9				30.6	10.8
18210	58-95	C2	5.3	38.0	40.3	78.3	9.7	5.8	15.5	40.3	6.2	.16	28.9	7.4

Lab. no.	Exch. cations me./100g. soil				Exch. Ca / Exch. Mg	Cation exch. cap., me./100g.	Base saturation, %	pH 1:1 ratio	$CaCO_3$ equiv., %	Organic carbon, %	Bulk density	Soil tests lb. per acre		
	Ca	Mg	K	Na								P_1	P_2	K
18200	10.3	2.2	1.14	.08	4.8	14.0	97			2.20		12	25	300+
18201	6.0	.9	.49	.06	6.8	8.2	90			.67	1.40	10	10	300+
18202	8.4	1.3	.42	.12	6.2	11.0	93			.44		10	15	300+
18203	10.4	2.7	.44	.12	3.9	14.7	93			.39		14	20	264
18204	11.7	5.1	.46	.12	2.3	18.7	93			.37	1.47	25	44	274
18205	10.0	7.5	.56	.18	1.3	21.7	84			.29		55	95	296
18206	7.6	7.6	.48	.13	1.0	20.8	76			.25		44	79	274
18207	6.4	7.4	.38	.15	.9	18.9	76			.21	1.52	34	63	234
18208	6.6	7.0	.30	.23	.9	16.1	88			.17	1.53	40	77	192
18209	7.8	7.2	.25	.33	1.1	15.9	98			.18		29	107	156
18210									19.7	.14	1.41	12	174	156

Profile No. 14 — Clinton Silt Loam (18)

Warren County, T.9N., R.1W., Sec. 2, NW160, NW40, NW10

Sampled in east bank of brush-covered roadside on 4- to 5-percent slope to north (steeper to north, less steep to south), about 400 feet south of township line, and about 25 miles east southeast from Mississippi River bluff. Parent material is Peorian loess nine feet thick, calcareous at a depth of 75 inches. Native vegetation was deciduous forest. Samples were collected in 1940 and description was written in 1962.

A_1, (0-5"), 16413-4 -- Dark gray (10YR 4/1) very friable silt loam; weak medium crumb; pH 6.2; abrupt smooth boundary.

A_2, (5-8"), 16415 -- Yellowish brown (10YR 5/4) very friable light silt loam; moderate thin platy breaking to weak medium crumb; pH 5.0; clear wavy boundary.

AB, (8-13"), 16416-7 -- Dark yellowish brown (10YR 4/4) friable light silty clay loam; moderate fine subangular blocky; thin light gray (10YR 6/1 dry) silty coatings; pH 5.0; gradual wavy boundary.

B_{21}, (13-22"), 16418-20 -- Dark yellowish brown (10YR 4/4) firm silty clay loam; moderate fine to medium subangular blocky; patchy light brownish gray (10YR 6/2 dry) silty coatings; pH 5.0; clear wavy boundary.

B_{22}, (22-37"), 16421-3 -- Yellowish brown (10YR 5/4) firm silty clay loam; few fine grayish brown (2.5Y 5/2) mottles; moderate medium subangular blocky; thick continuous clay films and patchy Fe (7.5YR 4/4) coatings; some Fe-Mn concretions; pH 4.8; gradual wavy boundary.

B_3, (37-48"), 16424 -- Brown to yellowish brown (10YR 5/3-5/4) friable light silty clay loam; common fine grayish brown mottles; weak to moderate medium to coarse subangular to angular blocky; patchy thin clay films; some Fe-Mn concretions; pH 5.0; gradual wavy boundary.

C_1, (48-75"), 16425-6 -- Grayish brown to light brownish gray (10YR 5/3-6/3) friable heavy silt loam; few faint yellowish brown mottles; weak coarse blocky; some Fe-Mn concretions; pH 6.0; clear smooth boundary.

C_2, (75-90"), 16427-8 -- Grayish brown to light brownish gray (2.5Y 5/2-6/2) friable silt loam; massive; calcareous.

Lab. no.	Depth, in.	Horizon	Particle size distribution of < 2 mm. (in mm.) (%)							Pores		Hydraulic conductivity, in./hr.	Moisture	
			Sand	Silt			Clay			Capillary, %	Noncapillary, %		⅓ atmos., %	15 atmos., %
			Total 2-.050	Coarse .050-.020	Fine .020-.002	Total .050-.002	Coarse .002-.0002	Fine < .0002	Total < .002					
16413	0-1	A1	1.0	44.8	38.0	82.8	10.5	5.7	16.2					
16414	1-5	A1	.9	45.9	40.4	86.3	10.1	2.7	12.8					
16415	5-8	A2	1.0	43.4	40.2	83.6	11.5	3.9	15.4					
16416	8-11	AB	.6	40.6	37.6	78.2	10.0	11.2	21.2					
16417	11-13	AB	.6	36.6	36.7	73.3	11.8	14.3	26.1					
16418	13-16	B21	.5	29.7	35.4	65.1	15.4	19.0	34.4					
16419	16-19	B21	.4	28.0	35.2	63.2	16.2	20.2	36.4					
16420	19-22	B21	.4	27.7	35.6	63.3	15.5	20.8	36.3					
16421	22-25	B22	.5	27.5	36.9	64.4	15.7	19.4	35.1					
16422	25-30	B22	.4	28.3	38.8	67.1	10.5	22.0	32.5					
16423	30-37	B22	.3	32.9	36.8	69.7	9.6	20.4	30.0					
16424	37-48	B3	.6	34.6	36.7	71.3	11.4	16.7	28.1					
16425	48-60	C1	.7	32.5	35.5	73.0	9.6	16.7	26.3					
16426	60-75	C1	1.2	39.8	35.7	75.5	8.4	14.9	23.3					
16427	75-80	C2	.8	38.3	46.5	84.8	10.4	4.0	14.4					
16428	80-90	C2	.6	32.5	50.7	83.2	10.6	5.6	16.2					

Lab. no.	Exch. cations me./100g. soil				Exch. Ca / Exch. Mg	Cation exch. cap., me./100g.	Base saturation, %	pH 1:1 ratio	$CaCO_3$ equiv., %	Organic carbon, %	Bulk density	Soil tests lb. per acre		
	Ca	Mg	K	Na								P_1	P_2	K
16413								5.4		3.38				
16414	1.0	1.2	.08	.22	.9	10.8	23	4.2		1.01				
16415	.2	1.7	.07	.19	.1	10.2	21	4.2		.50				
16416	1.0	3.5	.18	.13	.3	12.8	38	4.1		.38				
16417	3.2	4.5	.27	.16	.7	16.5	50	4.2		.31				
16418	5.9	6.4	.39	.19	.9	22.4	57	4.2		.31				
16419	7.4	7.4	.40	.24	1.0	24.8	62	4.1		.27				
16420	8.4	7.8	.45	.20	1.1	25.4	66	4.2		.26				
16421	9.1	7.4	.47	.24	1.2	26.0	66	4.3		.24				
16422	9.5	7.0	.44	.24	1.4	24.8	69	4.3		.23				
16423	9.3	6.8	.38	.23	1.4	23.1	72	4.4		.19				
16424	9.6	6.4	.35	.27	1.5	21.4	77	4.6		.20				
16425	9.9	6.4	.32	.25	1.5	19.2	88	4.9		.19				
16426	10.1	7.2	.30	.30	1.4	17.6	100+	5.7		.18				
16427	10.0	6.4	.23	.28	1.6	13.1	100+	7.3	10.64					
16428	10.0	6.7	.21	.26	1.5	13.7	100+	7.4	5.10					

Profile No. 15 — Clinton Silt Loam (18)

Knox County, T.10N., R.3E., Sec. 36, NE160, SE40, NW10

Sampled in roadside sod on a 2-percent slope to south, about 60 feet north of 40-rod line, and approximately 42 miles east southeast from Mississippi River bluff. Parent material is Peorian loess nine feet thick, calcareous at a depth of 90 inches. Native vegetation was deciduous forest. Samples collected in 1930 and description written in 1961.

A_1, (0-5"), 13788 -- Dark gray (10YR 4/1) friable silt loam; moderate fine crumb to weak very thin platy in lower part; clear wavy boundary.

A_2, (5-12"), 13789 -- Brown (10YR 5/3-6/3) slightly firm silt loam; weak thin platy; some worm holes filled with A_1 material in upper part; clear wavy boundary.

A_3, (12-16"), 13790 -- Yellowish brown (10YR 5/4) slightly firm light silty clay loam; weak fine subangular blocky; discontinuous light gray (10YR 7/2) silt coatings; clear smooth boundary.

B_1, (16-22"), 13791 -- Yellowish brown (10YR 5/5) firm silty clay loam; moderate fine subangular blocky; thin discontinuous light gray (10YR 7/2) silt coatings; clear smooth boundary.

B_{21}, (22-28"), 13791 -- Yellowish brown (10YR 5/5) firm silty clay loam; strong medium subangular blocky with moderately thick patchy light gray (10YR 7/1-6/1) silt coatings; clear smooth boundary.

B_{22}, (28-37"), 13792 -- Yellowish brown (10YR 5/5) firm silty clay loam; few fine faint brown (10YR 5/3) mottles; moderate medium to coarse subangular to angular blocky; thin discontinuous light gray (10YR 7/1-6/1) silt coatings and thin discontinuous brown (7.5YR 5/5) clay coatings; few fine Fe-Mn concretions; clear smooth boundary.

B_{31}, (37-45"), 13793 -- Yellowish brown (10YR 5/4) firm silty clay loam; common medium faint gray (10YR 6/1) mottles; moderate to weak coarse angular blocky; thin discontinuous brown (7.5YR 5/4) clay coatings; few fine Fe-Mn concretions; clear smooth boundary.

B_{32}, (45-56"), 13794 -- Yellowish brown (10YR 5/4) firm heavy silt loam; many medium faint light gray to light brownish gray (10YR 6/1-6/2) mottles; weak coarse angular blocky; thin discontinuous brown (7.5YR 5/4) clay coatings; few fine Fe-Mn concretions; clear smooth boundary.

C_1, (56-67"), 13795 -- Yellowish brown (10YR 5/4) slightly firm silt loam; common medium faint grayish brown to light brownish gray (10YR 5/2-6/2) mottles; massive; fine Fe-Mn concretions; gradual smooth boundary.

C_2, (67-76"), 13796 -- Yellowish brown (10YR 5/4) friable silt loam; massive.

Lab. no.	Depth, in.	Horizon	Particle size distribution of < 2 mm. (in mm.) (%) Sand Total 2-.050	Silt Coarse .050-.020	Silt Fine .020-.002	Silt Total .050-.002	Clay Coarse .002-.0002	Clay Fine < .0002	Clay Total < .002	Pores Capillary, %	Pores Non-capillary, %	Hydraulic conductivity, in./hr.	Moisture 1/3 atmos., %	Moisture 15 atmos., %
13788	0-5	A1	5.0			77.8			17.2					
13789	5-12	A2	1.7			75.6			22.7					
13790	12-16	A3	1.4			70.2			28.4					
13791	16-28	B1-B21	.8			62.8			36.4					
13792	28-37	B22	.7			63.8			35.5					
13793	37-45	B31	1.0			66.4			32.6					
13794	45-56	B32	.9			77.2			26.9					
13795	56-67	C1	2.3			74.8			22.9					
13796	67-76	C2	1.4			77.0			21.6					

Lab. no.	Exch. cations me./100g. soil Ca	Mg	K	Na	Exch. Ca / Exch. Mg	Cation exch. cap., me./100g.	Base saturation, %	pH 1:1 ratio	$CaCO_3$ equiv., %	Organic carbon, %	Bulk density	Soil tests lb. per acre P_1	P_2	K
13788	8.6	1.9	.56	.05	4.5	13.0	85	6.4		1.77				
13789	7.0	3.0	.35	.13	2.4	14.0	75	5.7		.46				
13790	9.4	2.8	.35	.11	3.4	18.4	69	5.9		.41				
13791	12.2	6.6	.47	.18	1.9	26.0	75	5.4		.32				
13792	10.3	7.0	.48	.29	1.5	27.4	66	5.0		.20				
13793	9.9	7.2	.43	.31	1.4	23.8	75	5.0		.20				
13794	9.4	7.0	.33	.28	1.3	21.0	81	5.8		.18				
13795	9.5	7.0	.27	.27	1.4	18.9	90	6.7		.16				
13796	9.2	6.5	.27	.23	1.4	16.7	97	6.8		.15				

Profile No. 16 — Keomah Silt Loam (17)

Woodford County, T.27N., R.3W., Sec. 10, SW160, NE40, NE10

Sampled in grazed woods pasture on 1.5-percent slope to north and northeast, 360 feet northwest along road from road corner (Y-junction of three roads), 180 feet north from center of road, and 3¼ miles southeast from Illinois River bluff. Parent material is Peorian loess 8½ feet thick, calcareous at a depth of 41 inches. Native vegetation was deciduous forest. On-site description written and samples taken in 1958.

A_1, (0-2"), 18180 -- Very dark gray (10YR 3/1) friable silt loam; moderate very fine crumb; woody and fibrous roots common; pH 6.3; abrupt smooth boundary.

A_{21}, (2-4"), 18181 -- Grayish-brown (10YR 5/2) friable silt loam; weak thin platy; woody and fibrous roots common; some filled and partially filled worm holes; few fine Fe-Mn concretions; pH 5.5; clear smooth boundary.

A_{22}, (4-9"), 18182 -- Brown (10YR 5/3) friable silt loam; weak medium platy breaking to weak fine subangular blocky; fibrous and woody roots common; some filled and partly filled worm holes; few fine Fe-Mn concretions; pH 5.0; clear smooth boundary.

B_1, (9-11"), 18183 -- Pale brown (10YR 6/3) friable silt loam; weak fine subangular blocky; fibrous and woody roots common; few fine Fe-Mn concretions; occasional unfilled worm channel; one small krotovina (1/2 to 1"); pH 5.2; clear smooth boundary.

B_{21}, (11-15"), 18184 -- Light yellowish brown (10YR 6/4) firm silty clay loam; moderate fine subangular blocky; discontinuous thin brown (10YR 5/3) clay films and some thin patchy light gray (10YR 7/2 dry) silt coatings; fibrous and woody roots common; common fine Fe-Mn concretions; occasional unfilled worm channel; pH 5.3; clear smooth boundary.

B_{22}, (15-22"), 18185 -- Light yellowish brown (10YR 6/4) firm silty clay loam mottled with common fine distinct light gray (10YR 7/2), grayish brown (10YR 5/2) and yellowish brown (10YR 5/4 and 5/8); weak fine prismatic breaking to moderate subangular blocky; thin discontinuous yellowish brown (10YR 5/5) clay films; occasional fibrous roots; woody roots common; few fine black (10YR 2/1) Fe-Mn concretions; occasional unfilled worm hole; pH 5.5; clear smooth boundary.

B_{23}, (22-29"), 18186 -- Mixed yellowish brown (10YR 5/4, 5/6 and 5/8), brown (10YR 5/3), and grayish brown (10YR 5/2) firm silty clay loam; weak coarse prismatic breaking to weak medium subangular blocky; grayish brown (10YR 5/2) thin discontinuous clay films; occasional fibrous roots; fine woody roots common; few fine to medium Fe-Mn concretions; an occasional cavity filled with grayish brown to light grayish brown (10YR 5/2-6/2) silty material; pH 6.0; gradual smooth boundary.

B_3, (29-35"), 18187 -- Mixed yellowish brown (10YR 5/4, 5/6 and 5/8), brown (10YR 5/3), and grayish brown (10YR 5/2) friable heavy silt loam to light silty clay loam; weak medium to coarse subangular blocky; grayish brown (10YR 5/2) thin discontinuous clay films; occasional fibrous roots; woody roots common; numerous fine to medium Fe-Mn concretions; an old tree root channel is filled with grayish brown (10YR 5/2-6/2) silty material surrounded with reddish brown (5YR 4/4) and strong brown (7.5YR 5/6) material; pH 6.5; clear wavy boundary.

C_1, (35-41"), 18188 -- Mixed yellowish brown (10YR 5/6) and light grayish brown (10YR 6/2) friable silt loam; massive; fine woody roots common; numerous fine to medium Fe-Mn concretions; pH 8.0; gradual wavy boundary.

C_2, (41-85"), 18189 -- Mixed yellowish brown (10YR 5/4, 5/6 and 5/8), light grayish brown (10YR 6/2), and light gray (10YR 7/2) friable silt loam; massive; calcareous; woody roots extending into the upper part; few fine to medium Fe-Mn concretions in upper part; old root channels filled with grayish brown (10YR 5/2-6/2) silty material; sample taken at 60- to 70-inch depth.

Lab. no.	Depth, in.	Horizon	Particle size distribution of < 2 mm. (in mm.) (%) Sand Total 2-.050	Silt Coarse .050-.020	Silt Fine .020-.002	Silt Total .050-.002	Clay Coarse .002-.0002	Clay Fine < .0002	Clay Total < .002	Pores Capillary, %	Pores Non-capillary, %	Hydraulic conductivity, in./hr.	Moisture 1/3 atmos., %	Moisture 15 atmos., %
18180	0-2	A1	4.7	30.1	48.9	79.0	9.1	6.3	15.4				37.9	11.3
18181	2-4	A21	4.3	31.0	48.3	79.3	10.8	3.6	14.4				32.8	6.8
18182	4-9	A22	3.4	28.6	47.3	75.9	12.5	7.4	19.9	37.3	7.0	.29	29.3	8.1
18183	9-11	B1	2.7	26.6	43.2	69.8	13.3	12.9	26.2				29.9	11.2
18184	11-15	B21	2.2	23.2	37.9	61.1	14.5	20.3	34.8				33.4	15.5
18185	15-22	B22	1.8	23.0	33.1	56.1	13.8	27.3	41.1	42.5	3.0	.04	38.5	19.6
18186	22-29	B23	1.7	26.6	32.4	59.0	12.5	23.7	36.2				37.1	17.6
18187	29-35	B3	1.9	32.1	32.5	64.6	10.2	21.8	32.0	41.7	3.9	.06	35.3	15.5
18188	35-41	C1	2.2	41.8	30.5	72.3	8.3	16.0	24.3				32.6	12.0
18189	41-85	C2	3.8	47.8	35.1	82.9	7.1	4.0	11.1	39.8	3.9	.02	27.2	5.8

Lab. no.	Exch. cations me./100g. soil Ca	Mg	K	Na	Exch. Ca / Exch. Mg	Cation exch. cap., me./100g.	Base saturation, %	pH 1:1 ratio	$CaCO_3$ equiv., %	Organic carbon, %	Bulk density	Soil tests lb. per acre P_1	P_2	K
18180	12.7	3.8	.2	.1	3.3	16.2	100+	6.4		3.26		18	22	260
18181	6.0	2.1	.2	.1	2.9	9.4	93	5.9		1.12		11	15	116
18182	5.8	3.0	.2	.1	1.9	10.3	88	5.5		.46	1.32	14	18	154
18183	7.8	5.0	.2	.1	1.6	14.9	87	5.3		.40		18	26	185
18184	11.3	7.8	.3	.1	1.4	21.5	92	5.1		.35		19	25	232
18185	14.8	10.4	.4	.1	1.4	26.8	97	5.3		.39	1.46	21	28	260
18186	13.0	10.4	.4	.1	1.3	24.0	100+	5.7		.38		16	21	216
18187	12.1	10.3	.3	.1	1.2	20.9	100+	6.4		.35	1.49	16	48	178
18188								6.9		.27		15	162	160
18189								7.7	27.9	.15	1.58	10	48	116

Profile No. 17 — Keomah Silt Loam (17)

McLean County, T.24N., R.1W., Sec. 10, SW160, NW40, NE10

Sampled in grazed permanent pasture, on 1.5-percent slope to southwest, 430 feet east of culverts, 50 feet south of center of gravel road; 19 miles southeast from Illinois River bluff. Parent material is Peorian loess six feet thick, calcareous at a depth of 41 inches. Native vegetation was deciduous forest. On-site description written and samples collected in 1958.

A_1, (0-4"), 18190 -- Very dark gray (10YR 3/1) friable silt loam; weak fine crumb; fibrous roots common; pH 6.0; abrupt smooth boundary.

A_2, (4-8"), 18191 -- Grayish brown (10YR 5/2) friable silt loam; weak fine to medium crumb; fibrous roots common; an occasional worm hole; pH 5.5; abrupt smooth boundary.

A_3, (8-11"), 18192 -- Brown (10YR 5/3) friable silt loam; moderate fine to medium granular; fibrous roots common; occasional worm hole; pH 5.0; clear smooth boundary.

B_1, (11-14"), 18193 -- Pale brown (10YR 6/3) friable light silty clay loam; moderate very fine to fine subangular blocky; some thin patchy light gray (10YR 7/1) silt coatings; fibrous roots occasional; an occasional worm hole; pH 4.5; clear smooth boundary.

B_{21}, (14-20"), 18194 -- Brown (10YR 5/3) firm silty clay loam; mottles are many fine faint yellowish brown (10YR 5/4 and 5/6), light grayish brown (10YR 6/2), and light gray (10YR 6/1); moderate medium subangular blocky; thin continuous dark grayish brown (10YR 4/2) clay films; occasional fibrous roots; an occasional worm hole; few fine reddish brown (5YR 4/3) and very dark gray (10YR 3/1) Fe-Mn concretions; pH 4.5; clear smooth boundary.

B_{22}, (20-28"), 18195 -- Varigated grayish brown (10YR 5/2), brown (10YR 5/3), yellowish brown (10YR 5/4, 5/6 and 5/8), light brownish gray (10YR 6/2), and pale brown (10YR 6/3) firm silty clay loam; weak fine prismatic breaking to moderate medium subangular blocky; thin continuous dark grayish brown (10YR 4/2) clay films; occasional fibrous roots; occasional worm channel; few fine Fe-Mn concretions; pH 5.0; clear smooth boundary.

B_{23}, (28-33"), 18196 -- Mixed light brownish gray (2.5Y 6/2) and yellowish brown (10YR 5/4) firm silty clay loam; mottled common fine distinct grayish brown (10YR 5/2), dark grayish brown (10YR 4/2), and yellowish brown (10YR 5/8); weak medium prismatic breaking to moderate coarse subangular blocky; thick discontinuous dark grayish brown (10YR 4/2) clay films; very dark gray (10YR 3/1) organic material coats and fills some worm channels; very occasional root channel; many fine Fe-Mn concretions; pH 5.0; gradual smooth boundary.

B_3, (33-41"), 18197 -- Yellowish brown (10YR 5/4) firm light silty clay loam; mottled many medium distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/6 and 5/8); weak very coarse prismatic; thin discontinuous black (10YR 2/1) organic coatings (when seen on a fresh aggregate face these coatings resemble a coarse spider web); many fine very dark grayish brown (10YR 3/2) Fe-Mn concretions; pH 7.0; clear smooth boundary.

C_1, (41-48"), 18198 -- Mixed light brownish gray (10YR 6/2) and yellowish brown (10YR 5/6 and 5/8) friable silt loam; massive; calcareous; krotovinas continue from B_3 (33-41") into this horizon; numerous white (10YR 8/2) lime concretions; a few worm channels filled with black (10YR 2/1) organic material; gradual smooth boundary.

C_2, (48-70"), 18199 -- Mixed light olive brown (2.5Y 5/4), yellowish brown (10YR 5/6 and 5/8), and light gray (10YR 6/1) friable silt loam; massive; calcareous; upper part has some white (10YR 8/2) lime concretions.

Lab. no.	Depth, in.	Horizon	Particle size distribution of < 2 mm. (in mm.) (%)							Pores		Hydraulic conductivity, in./hr.	Moisture	
			Sand	Silt			Clay			Capillary, %	Noncapillary, %		1/3 atmos., %	15 atmos., %
			Total 2-.050	Coarse .050-.020	Fine .020-.002	Total .050-.002	Coarse .002-.0002	Fine < .0002	Total < .002					
18190	0-4	A1	2.2	30.0	51.0	81.0	10.7	4.4	15.1				41.4	11.3
18191	4-8	A2	2.3	32.2	51.4	83.6	8.7	4.4	13.1	35.2	4.8	.41	29.8	5.4
18192	8-11	A3	1.8	27.3	49.4	76.7	11.7	8.4	20.1				28.9	8.0
18193	11-14	B1	1.3	25.3	44.1	69.4	12.7	15.6	28.3				32.2	17.2
18194	14-20	B21	1.2	20.5	39.4	59.9	15.0	22.6	37.6	40.3	2.6	.18	36.3	17.1
18195	20-28	B22	1.2	18.8	38.7	57.5	13.4	25.8	39.2				39.1	18.6
18196	28-33	B23	1.2	24.7	35.4	60.1	12.6	23.0	35.6	44.5	2.0	.01	38.2	17.4
18197	33-41	B3	1.1	27.9	38.4	66.3	12.5	18.0	30.5				33.9	15.2
18198	41-48	C1	1.1	22.1	48.8	70.9	15.4	10.3	25.7				30.8	12.5
18199	48-70	C2	2.4	21.1	51.2	72.3	14.3	9.2	23.5	40.0	3.8	.08	31.0	11.7

Lab. no.	Exch. cations me./100g. soil				Exch. Ca / Exch. Mg	Cation exch. cap., me./100g.	Base saturation, %	pH 1:1 ratio	$CaCO_3$ equiv., %	Organic carbon, %	Bulk density	Soil tests lb. per acre		
	Ca	Mg	K	Na								P_1	P_2	K
18190	8.3	4.4	.2	.1	1.9	14.0	93	5.8		3.02		20	28	172
18191	2.3	1.6	.1	.1	1.4	6.9	65	5.2		.61	1.50	29	44	56
18192	3.2	3.6	.1	.1	.9	11.1	67	4.9		.39		25	32	136
18193	4.4	6.3	.3	.1	.7	17.2	66	4.7		.40		26	48	185
18194	5.5	11.4	.3	.1	.5	25.5	69	4.4		.36	1.45	24	30	232
18195	7.0	12.7	.4	.1	.6	27.5	74	4.4		.37		24	30	232
18196	8.1	13.9	.3	.1	.6	24.0	93	4.8		.35	1.41	20	22	208
18197	8.4	11.7	.3	.1	.7	18.1	100+	6.7		.31		11	174	172
18198								7.8	21.1	.19		10	91	148
18199								8.1	24.7	.15	1.52	12	30	148

Profile No. 18 — Rushville Silt Loam (16)

Warren County, T.10N., R.1W., Sec. 26, NE160, SE40, NE10

Sampled in alfalfa field in very shallow depression, 300 feet south of quarter-mile line fence, 134 feet west of fence along gravel road, and 26 miles east southeast from Mississippi River bluff. Parent material is Peorian loess 11 feet thick, all noncalcareous. Native vegetation was deciduous forest. On-site description written and samples collected in 1966.

Ap, (0-6"), 20156 -- Very dark grayish brown (10YR 3/2) friable silt loam; weak thin platy breaking to weak fine crumb in lower part; roots abundant; pH 6.5; abrupt smooth boundary.

A_2, (6-12"), 20157 -- Light gray (10YR 6/1) friable silt loam; mottled few fine distinct yellowish brown (10YR 5/4); moderate very thin to thin platy; roots common; few fine Fe-Mn concretions; pH 6.0; abrupt smooth boundary.

AB, (12-15"), 20158 -- Gray (10YR 5/1) friable heavy silt loam to light silty clay loam; many fine distinct yellowish brown (10YR 5/4) mottles; moderate to strong medium to coarse prismatic breaking to weak to moderate medium subangular blocky; discontinuous light gray (10YR 6/1) silt coatings; few fine Fe-Mn concretions; pH 5.8; abrupt smooth boundary.

B_{21}, (15-18"), 20159 -- Gray (10YR 5/1) firm heavy silty clay loam to light silty clay; many medium prominent strong brown (7.5YR 5/6) and yellowish brown (10YR 5/4) mottles; moderate to strong coarse prismatic breaking to moderate medium to coarse subangular and angular blocky; continuous light brownish gray (10YR 6/2) silt coatings and discontinuous dark gray (10YR 4/1) clay coatings; common worm holes filled or lined with very dark gray (10YR 3/1) clay-organic material; common fine Fe-Mn concretions; roots common; pH 5.0; clear smooth boundary.

B_{22}, (18-22"), 20160 -- Gray (10YR 5/1) firm heavy silty clay loam to light silty clay; many medium prominent strong brown (7.5YR 5/6) and yellowish brown (10YR 5/4) mottles; moderate to strong coarse prismatic breaking to moderate medium to coarse subangular and angular blocky; discontinuous light brownish gray (10YR 6/2) silt coatings and discontinuous dark gray (10YR 4/1) clay coatings; common worm holes filled or lined with very dark gray (10YR 3/1) clay-organic material; common fine Fe-Mn concretions; roots common; pH 5.0; clear smooth boundary.

B_{23}, (22-27"), 20161 -- Gray (10YR 5/1) firm heavy silty clay loam to light silty clay; many fine prominent strong brown (7.5YR 5/6) and yellowish brown (10YR 5/4) and many fine faint grayish brown (10YR 5/2) mottles; moderate coarse to very coarse prismatic breaking to weak to moderate coarse angular and subangular blocky; very dark gray (10YR 3/1) clay-organic coatings discontinuous in horizontal and continuous in vertical; patchy light brownish gray (10YR 6/2) silt coatings near the top of horizon; roots common; common worm casts or holes filled with very dark gray (10YR 3/1) clay-organic material; common fine Fe-Mn concretions; pH 5.3; clear smooth boundary.

B_{24}, (27-35"), 20162 -- Gray (10YR 5/1) to grayish brown (10YR 5/2) firm medium to heavy silty clay loam; many fine distinct yellowish brown (10YR 5/4, and 5/6) mottles; weak coarse angular blocky; discontinuous dark grayish brown (10YR 4/2) clay coatings; roots abundant; a few worm casts filled with very dark gray (10YR 3/1) clay-organic material; many fine Fe-Mn concretions; pH 5.5; clear smooth boundary.

B_{31}, (35-45"), 20163 -- Grayish brown (2.5Y 5/2) friable light silty clay loam; common fine distinct dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/6) mottles; weak thin platy; dark grayish brown (10YR 4/2) patchy clay coatings; occasional roots; abundant fine to medium Fe-Mn concretions; pH 5.7; gradual smooth boundary.

B_{32}, (45-53"), 20164 -- Light gray (10YR 6/1) to light brownish gray (10YR 6/2) friable light silty clay loam; common fine to medium distinct yellowish brown (10YR 5/4 and 5/6) mottles; weak thin platy; no roots; many fine Fe-Mn concretions; pH 5.7; diffuse smooth boundary.

C_1, (53-75"), 20165-7 -- Gray (10YR 5/1) to light gray (10YR 6/1) friable heavy silt loam; many fine to medium dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/6) mottles; massive; common Fe-Mn concretions; pH 5.7; diffuse smooth boundary.

C_2, (75-106"), 20168-71 -- Grayish brown (2.5Y 5/2) friable heavy silt loam; common fine to medium distinct dark yellowish brown (10YR 4/4) mottles; massive; many fine Fe-Mn concretions; pH 6.0; diffuse smooth boundary.

C_3, (106-119"), 20172-3 -- Mixed 50% gray (10YR 6/1) and light brownish gray (10YR 6/2), and 50% dark yellowish brown (10YR 4/4) friable silt loam; massive; no roots; common fine Fe-Mn concretions; common thread-like channels filled with very dark grayish brown (10YR 3/2) material; pH 6.2; abrupt smooth boundary.

C_4, (119-121"), 20174 -- Dark yellowish brown (10YR 4/4) 90% and light brownish gray (10YR 6/2) 10% friable silt loam (considered an Fe band); massive; few fine Fe-Mn concretions; pH 6.2; abrupt smooth boundary.

C_5, (121-126"), 20175 -- Grayish brown (10YR 5/2) friable silt loam; common fine to medium distinct dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/4) mottles; massive; common fine Fe-Mn concretions; pH 6.2; abrupt smooth boundary.

C_6, (126-128"), 20176 -- Dark yellowish brown (10YR 4/4) 80% and grayish brown (10YR 5/2) 20% friable silt loam; massive; common fine Fe-Mn concretions; pH 6.2; abrupt smooth boundary.

C_7, (128-132"), 20177 -- Grayish brown (10YR 5/2) friable heavy silt loam; common fine to medium distinct dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/4) mottles; massive; common fine Fe-Mn concretions; pH 6.2; clear smooth boundary to brown (7.5YR 4/2) Farmdale loess below.

Lab. no.	Depth, in.	Horizon	Particle size distribution of $<$ 2 mm. (in mm.) (%)							Pores		Hydraulic conductivity, in./hr.	Moisture	
			Sand	Silt			Clay			Capillary, %	Non-capillary, %		1/3 atmos., %	15 atmos., %
			Total 2-.050	Coarse .050-.020	Fine .020-.002	Total .050-.002	Coarse .002-.0002	Fine $<$ .0002	Total $<$ .002					
20156	0-6	Ap	3.5	40.5	42.1	82.6	7.7	6.2	13.9					
20157	6-12	A2	4.3	40.9	43.1	84.0	7.6	4.1	11.7					
20158	12-15	AB	4.1	37.0	36.9	73.9	10.7	11.3	22.0					
20159	15-18	B21	3.6	31.2	34.8	66.0	13.1	17.3	30.4					
20160	18-22	B22	3.8	25.3	30.6	55.9	14.0	26.3	40.3					
20161	22-27	B23	3.8	24.9	31.6	56.5	12.9	26.8	39.7					
20162	27-35	B24	4.1	25.6	33.9	59.5	13.0	23.4	36.4					
20163	35-45	B31	4.3	29.2	36.1	65.3	11.4	19.0	30.4					
20164	45-53	B32	3.8	32.3	36.6	68.9	10.6	16.7	27.3					
20165	53-61	C1	4.0	37.6	34.6	72.2	9.9	13.9	23.8					
20166	61-69	C1	3.5	37.1	36.9	74.0	9.2	13.3	22.5					
20167	69-75	C1	3.3	38.4	36.0	74.4	9.7	12.6	22.3					
20168	75-83	C2	3.2	38.3	36.6	74.9	8.9	13.0	21.9					
20169	83-92	C2	2.4	39.0	36.7	75.7	8.5	13.4	21.9					
20170	92-99	C2	.8	41.7	37.1	78.8	7.4	13.0	20.4					
20171	99-106	C2	1.3	37.7	41.0	78.7	7.2	12.8	20.0					
20172	106-113	C3	1.0	35.8	43.5	79.3	7.2	12.5	19.7					
20173	113-119	C3	1.3	27.2	50.8	78.0	7.7	13.0	20.7					
20174	119-121	C4	1.7	26.2	50.9	77.1	8.2	13.0	21.2					
20175	121-126	C5	2.1	26.6	50.8	77.4	7.8	12.7	20.5					
20176	126-128	C6	1.2	28.1	50.1	78.2	7.6	13.0	20.6					
20177	128-132	C7	4.1	24.9	50.3	75.2	8.3	12.4	20.7					

Lab. no.	Exch. cations me./100g. soil				Exch. Ca / Exch. Mg	Cation exch. cap., me./100g.	Base saturation, %	pH 1:1 ratio	$CaCO_3$ equiv., %	Organic carbon, %	Bulk density	Soil tests lb. per acre		
	Ca	Mg	K	Na								P_1	P_2	K
20156	6.4	1.0	.13	.05	6.6	10.8	70	5.9		1.14		115	125+	106
20157	2.8	.8	.09	.05	3.3	6.3	60	5.3		.27		50	72	86
20158	5.5	2.5	.21	.10	2.2	13.2	63	4.9		.28		107	125+	218
20159	7.8	4.2	.31	.14	1.9	19.0	66	4.8		.33		120	125+	338
20160	11.0	6.4	.44	.21	1.7	26.5	68	4.7		.32		120	125+	400+
20161	11.3	7.0	.57	.26	1.6	27.2	70	4.8		.29		125+	125+	400+
20162	10.8	6.6	.55	.29	1.6	25.2	72	4.8		.06		125+	125+	400+
20163	10.5	6.4	.40	.30	1.6	21.8	81	5.0		.09		115	125+	400+
20164	9.9	6.1	.38	.30	1.6	20.2	82	5.2		.15		87	125+	400+
20165	9.0	5.4	.33	.28	1.7	17.8	85	5.3		.11		64	125+	346
20166	9.0	5.5	.35	.27	1.6	17.3	87	5.5		.11		54	125+	362
20167	8.7	5.3	.33	.25	1.6	17.2	85	5.5		.17		64	125+	362
20168	9.1	5.3	.33	.25	1.7	16.7	90	5.6		.13		72	125+	393
20169	9.0	5.3	.33	.25	1.6	17.0	89	5.6		.11		70	125+	362
20170	8.6	5.3	.31	.24	1.6	15.9	91	5.7		.13		59	125+	326
20171	8.6	5.1	.28	.24	1.7	15.7	91	5.9		.11		57	125+	292
20172	8.5	4.9	.27	.22	1.8	16.7	83	5.8		.12		50	125+	288
20173	8.3	5.0	.25	.21	1.6	16.5	83	5.9		.11		40	125+	268
20174	8.3	4.9	.25	.21	1.7	15.2	89	6.1		.11		40	125+	272
20175	8.6	5.2	.27	.22	1.6	15.6	92	6.0		.15		45	125+	322
20176	8.2	5.0	.30	.23	1.6	15.3	90	6.1		.11		42	125+	306
20177	8.4	5.1	.26	.22	1.7	15.7	89	6.0		.11		49	125+	280

Profile No. 19 — Joy Silt Loam (275)

Mercer County, T.13N., R.4W., Sec. 23, NW160, SW40, SW10

Sampled in roadside sod, on 1.5-percent slope to west, 70 feet north of railroad tracks, and 1¼ miles east northeast from Mississippi River bluff. Parent material is Peorian loess 17 feet thick, calcareous at a depth of 64 inches. Native vegetation was tall-grass prairie. The samples were collected in 1939, but the following description was written in 1961 adjacent to the former pit.

A_1, (0-14"), 15873-4 -- Black (10YR 2/1) friable silt loam showing grayish silt grains when dry; moderate medium granular; clear smooth boundary.

A_3, (14-19"), 15875 -- Very dark gray (10YR 3/1) and some dark brown (10YR 4/3) friable silt loam showing grayish silt grains when dry; moderate medium to coarse granular; clear smooth boundary.

B_1, (19-24"), 15876 -- Brown to dark brown (10YR 4/3) friable silt loam with some 10YR 3/2 in pores and channels; moderate medium subangular blocky with occasional patchy dark yellowish brown (10YR 4/4) clay films; clear smooth boundary.

B_{21}, (24-29"), 15877 -- Yellowish brown (10YR 5/4) friable to slightly firm silt loam; very dark grayish brown (10YR 3/2) in pores and cracks; moderate medium subangular blocky; occasional patchy dark yellowish brown (10YR 4/4) clay coating; gradual smooth boundary.

B_{22}, (29-35"), 15878 -- Yellowish brown (10YR 5/4) friable to slightly firm silt loam; some very dark grayish brown (10YR 3/2) in pores and cracks; few fine distinct light olive brown (2.5Y 5/4) mottles; weak to moderate medium subangular blocky with occasional patchy dark yellowish brown (10YR 4/4) clay coatings; gradual smooth boundary.

B_{23}, (35-41"), 15879 -- Brown (10YR 4/3) friable to slightly firm silt loam; fine pores filled with 10YR 3/2 material; common medium distinct light brownish gray (2.5Y 6/2) mottles; weak to moderate medium subangular blocky with occasional patchy dark yellowish brown (10YR 4/4) clay films; clear smooth boundary.

B_{31}, (41-47"), 15880 -- Brown (10YR 4/3) friable silt loam; few pores filled with very dark grayish brown (10YR 3/2) material; common medium distinct grayish brown (2.5Y 5/2) mottles; weak coarse subangular blocky; many brown (7.5YR 4/4) Fe splotches and soft concretions; gradual smooth boundary.

B_{32}, (47-55"), 15881 -- Brown (10YR 4/3) and grayish brown (2.5Y 5/2) friable silt loam; weak coarse subangular blocky; many brown (7.5YR 4/4) Fe splotches and soft concretions; clear smooth boundary.

C_1, (55-64"), 15882 -- Dark yellowish brown (10YR 4/4) friable silt loam with many medium prominent grayish brown (2.5Y 5/2) mottles; massive; many coarse strong brown (7.5YR 5/6) Fe splotches and concretions; clear smooth boundary.

C_2, (64-69"), 15883 -- Yellowish brown (10YR 5/4) friable silt loam with many coarse prominent gray (10YR 6/1) and yellowish brown (10YR 5/8) mottles; massive; calcareous with lime concretions; clear smooth boundary.

C_3, (69-75"), 15884 -- Gray to light gray (10YR 6/1) friable silt loam with common medium prominent yellowish brown (10YR 5/8) and few coarse prominent strong brown (7.5YR 5/6) mottles; massive; calcareous with lime concretions; gradual smooth boundary.

C_4, (75-80"), 15885 -- Gray to light gray (10YR 6/1) friable silt loam; many medium prominent yellowish brown (10YR 5/4 and 5/8) mottles; common Fe concretions; massive; calcareous.

Lab. no.	Depth, in.	Horizon	Particle size distribution of < 2 mm. (in mm.) (%)							Pores		Hydraulic conductivity, in./hr.	Moisture	
			Sand	Silt			Clay			Capillary, %	Noncapillary, %		⅓ atmos., %	15 atmos., %
			Total 2-.050	Coarse .050-.020	Fine .020-.002	Total .050-.002	Coarse .002-.0002	Fine < .0002	Total < .002					
15873	0-7	A1	1.7	58.9	21.6	80.5	4.5	13.3	17.8					
15874	7-14	A1	1.3	55.2	22.6	77.8	6.1	14.8	20.9					
15875	14-19	A3	1.0	54.4	22.5	76.9	6.3	15.8	22.1					
15876	19-24	B1	1.3	53.9	23.4	77.3	7.1	14.3	21.4					
15877	24-29	B21	.8	54.0	23.4	77.4	8.5	13.3	21.8					
15878	29-35	B22	1.1	54.9	22.4	77.3	8.3	13.3	21.6					
15879	35-41	B23	1.2	54.4	22.6	77.0	8.3	13.5	21.8					
15880	41-47	B31	2.8	55.7	21.5	77.2	7.8	12.2	20.0					
15881	47-55	B32	2.8	55.5	21.5	77.0	7.3	12.9	20.2					
15882	55-64	C1	3.2	54.6	21.9	76.5	8.0	12.3	20.3					
15883	64-69	C2	2.9	61.6	22.0	83.6	7.7	5.8	13.5					
15884	69-75	C3	2.1	60.8	23.9	84.7	8.7	4.5	13.2					
15885	75-80	C4	2.0	59.6	25.3	84.9	11.2	1.9	13.1					

Lab. no.	Exch. cations me./100g. soil				Exch. Ca / Exch. Mg	Cation exch. cap., me./100g.	Base saturation, %	pH 1:1 ratio	$CaCO_3$ equiv., %	Organic carbon, %	Bulk density	Soil tests lb. per acre		
	Ca	Mg	K	Na								P_1	P_2	K
15873	10.2	2.5	.53	.07	4.1	17.3	77	5.3		3.26				
15874	9.1	2.7	.29	.09	3.4	18.3	67	5.2		2.13				
15875	8.7	2.8	.25	.10	3.2	18.1	65	5.3		1.78				
15876	8.8	3.0	.23	.10	3.0	17.3	70	5.4		1.29				
15877	8.8	3.4	.21	.13	2.6	16.5	76	5.5		.93				
15878	9.0	3.8	.21	.14	2.4	15.8	83	5.6		.52				
15879	10.0	4.7	.23	.15	2.1	16.0	94	5.8		.27				
15880	9.6	5.2	.23	.17	1.9	15.2	99	5.9		.18				
15881	9.4	5.0	.25	.17	1.9	15.3	97	6.1		.12				
15882	10.0	5.6	.26	.20	1.8	15.1	100	6.4		.10				
15883	10.2	6.2	.22	.18	1.7	12.3	100	7.1						
15884						11.0	100	7.7	13.0					
15885						12.4	100	7.8	13.0					

Profile No. 20 — Joy Silt Loam (275)

Mercer County, T.14N., R.4W., Sec. 30, NE160, NW40, NW10

Sampled in roadside bluegrass sod on 1.5-percent slope to northeast, about 40 rods south of road corner (T-road), 1¾ miles northeast from Mississippi River bluff. Parent material is Peorian loess more than 20 feet thick, calcareous at a depth of 48 inches. Native vegetation was tall-grass prairie, chiefly Big Bluestem *(Andropogon gerardi)*. Samples were collected in 1939. The following description was written in 1961 adjacent to former pit.

A_1, (0-13"), 15858-60 -- Black (10YR 2/1) friable silt loam showing grayish silt particles when dry; moderate medium granular to crumb; clear smooth boundary.

A_3, (13-19"), 15861 -- Mixed very dark gray (10YR 3/1) and dark grayish brown (10YR 4/2) friable silt loam showing grayish specking when dry; moderate medium granular; clear smooth boundary.

B_1, (19-22"), 15862 -- Mixed very dark grayish brown (10YR 3/2) and dark yellowish brown (10YR 4/4) friable silt loam; moderate medium subangular blocky; clear smooth boundary.

B_{21}, (22-25"), 15863 -- Mixed very dark grayish brown (10YR 3/2) and brown (10YR 4/3) slightly firm silt loam; few fine faint grayish brown (2.5Y 5/2) mottles; moderate medium subangular blocky; patchy dark brown (10YR 3/3) clay coatings; gradual smooth boundary.

B_{22}, (25-32"), 15864-5 -- Brown (10YR 4/3) slightly firm silt loam; few fine faint light brownish gray (2.5Y 6/2) and few fine prominent strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky; few patchy dark brown (10YR 3/3) clay coatings; some pores filled with very dark gray (10YR 3/1) material; clear smooth boundary.

B_{23}, (32-36"), 15866-7 -- Brown (10YR 4/3) slightly firm silt loam; many coarse distinct light brownish gray (2.5Y 6/2) and common coarse prominent strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky; few patchy dark brown (10YR 3/3) clay coatings; few pores filled with very dark gray (10YR 3/1) material; clear smooth boundary.

B_{24}, (36-42"), 15868 -- Light brownish gray (2.5Y 6/2) slightly firm silt loam; many coarse prominent strong brown (7.5YR 5/6) and very dark gray (10YR 3/1) mottles; weak coarse subangular to angular blocky; dark grayish brown (2.5Y 4/2) clay coatings; some Fe concretions; gradual smooth boundary.

B_3, (42-48"), 15869 -- Light brownish gray (2.5Y 6/2) slightly firm silt loam; many coarse prominent strong brown (7.5YR 5/8) and few fine prominent very dark gray (10YR 3/1) mottles; weak coarse angular blocky; patchy dark grayish brown (2.5Y 4/2) clay coatings; Fe-Mn concretions; clear smooth boundary.

C_1, (48-68"), 15870-1 -- Light brownish gray (2.5Y 6/2) friable silt loam; many coarse prominent yellowish brown (10YR 5/6) mottles; massive; calcareous with lime concretions; very dark brown (10YR 2/2) Fe-Mn concretions; gradual smooth boundary.

C_2, (68-74"), 15872 -- Light brownish gray (2.5Y 6/2) friable silt loam; common medium prominent yellowish brown (10YR 5/8) mottles; massive; calcareous; very dark brown (10YR 2/2) Fe-Mn concretions.

Lab. no.	Depth, in.	Horizon	Particle size distribution of < 2 mm. (in mm.) (%)							Pores		Hydraulic conductivity, in./hr.	Moisture	
			Sand	Silt			Clay							
			Total 2-.050	Coarse .050-.020	Fine .020-.002	Total .050-.002	Coarse .002-.0002	Fine < .0002	Total < .002	Capillary, %	Noncapillary, %		⅓ atmos., %	15 atmos., %
15858	0-5	A1	1.0	56.5	24.9	81.4	5.0	12.6	17.6					
15859	5-10	A1	1.0	54.0	26.5	80.5	5.3	13.2	18.5					
15860	10-13	A1	1.1	53.7	25.9	79.6	5.7	13.6	19.3					
15861	13-19	A3	1.2	51.3	27.6	78.9	8.8	11.1	19.9					
15862	19-22	B1	1.2	51.0	27.8	78.8	8.3	11.7	20.0					
15863	22-25	B21	.9	50.7	26.7	77.4	8.6	13.1	21.7					
15864	25-27	B22	1.3	49.7	24.8	74.5	9.2	15.0	24.2					
15865	27-32	B22	1.2	50.4	24.4	74.8	8.1	15.9	24.0					
15866	32-34	B23	1.6	45.1	29.5	74.6	9.6	14.2	23.8					
15867	34-36	B23	1.4	43.2	29.0	72.2	11.9	14.5	26.4					
15868	36-42	B24	2.4	44.3	27.0	76.3	9.5	16.8	26.3					
15869	42-48	B3	2.5	52.1	23.2	75.3	6.9	15.3	22.2					
15870	48-60	C1	2.0	53.8	24.9	78.7	9.3	10.0	19.3					
15871	60-68	C1	2.6	51.3	27.1	78.4	9.0	10.0	19.0					
15872	68-74	C2	2.0	41.5	34.0	75.5	12.7	9.8	22.5					

Lab. no.	Exch. cations me./100g. soil				Exch. Ca / Exch. Mg	Cation exch. cap., me./100g.	Base saturation, %	pH 1:1 ratio	$CaCO_3$ equiv., %	Organic carbon, %	Bulk density	Soil tests lb. per acre		
	Ca	Mg	K	Na								P_1	P_2	K
15858	16.7	3.2	.20	.11	5.3	22.4	90	6.1		3.18				
15859	14.4	3.0	.15	.11	4.8	20.4	87	6.1		2.63				
15860	9.8	2.6	.15	.10	3.8	17.6	72	5.6		2.14				
15861	8.0	2.4	.16	.12	3.4	15.5	68	5.2		1.46				
15862	8.0	2.6	.16	.13	3.1	15.3	71	5.2		1.12				
15863	8.8	2.8	.21	.16	3.2	16.3	74	5.0		.91				
15864	10.2	3.6	.20	.13	2.8	18.0	79	5.0		.68				
15865	10.7	4.1	.22	.15	2.6	18.2	83	5.1		.51				
15866	10.2	4.0	.25	.20	2.5	17.4	84	5.1		.36				
15867	12.4	5.0	.28	.15	2.5	20.0	89	5.4		.28				
15868	13.2	5.4	.32	.17	2.5	21.2	90	5.6		.22				
15869	11.6	5.0	.28	.17	2.4	18.5	92	6.0		.17				
15870								7.2	5.0					
15871								7.8	12.0					
15872								7.8	11.0					

Profile No. 21 — Tama Silt Loam (36)

Ogle County, T.24N., R10E., Sec. 19, NE160, NW40, NW10

Sampled in roadside bluegrass sod, slightly below crest of ridge on 2-percent slope to west (higher ground one-fourth mile to south and southeast), about 31 rods east of half-mile line, and 36 miles east from Mississippi River bluff, 13 miles north of north edge of Green River basin, and 2 miles northwest from Rock River. Parent material is Peorian loess five feet thick, all noncalcareous. Native vegetation was tall-grass prairie, chiefly Big Bluestem. On-site description written and samples collected in 1957.

A_1, (0-10"), 18120 -- Very dark brown (10YR 2/2), (10YR 4/1 dry) with speckings of white (10YR 8/1 dry) friable silt loam; very weak platy in place breaking to medium to coarse crumb or soft granular; fibrous roots numerous; gradual smooth boundary.

A_3, (10-16"), 18121 -- Very dark grayish brown (10YR 3/2) friable silt loam showing white (10YR 8/1) specks when dry; weak medium to coarse crumb or granular to very weak fine subangular blocky; fibrous roots numerous; worm burrows common; some worm casts of darker material from A_1; gradual smooth boundary.

B_1, (16-22"), 18122 -- Dark brown (10YR 3/3-4/3) friable silt loam borderline to silty clay loam; weak fine subangular blocky; very thin grayish specks on aggregate surfaces when dry; fibrous roots common; worm burrows common; gradual smooth boundary.

B_{21}, (22-29"), 18123 -- Dark yellowish brown (10YR 4/4) moderately firm light silty clay loam; weak fine subangular blocky; fibrous roots common; worm burrows common; gradual smooth boundary.

B_{22}, (29-34"), 18124 -- Dark brown (10YR 4/3) crushes to brown (10YR 5/3) firm silty clay loam; moderate fine to medium subangular blocky; very thin grayish speckings when dry; fibrous roots common; worm burrows common; clear smooth boundary.

B_{23}, (34-43"), 18125 -- Brown (10YR 4/3-5/3) firm silty clay loam; moderate medium to fine subangular blocky; faint grayish (when dry) discontinuous coatings; roots few; worm burrows few; few small soft yellowish brown (10YR 5/8) and dark brown (7.5YR 3/2) Fe-Mn concretions; clear smooth boundary.

B_3, (43-52"), 18126 -- Yellowish brown (10YR 5/4) firm light silty clay loam; weak coarse subangular to angular blocky to nearly massive; roots few; worm burrows few; fine soft yellowish brown (10YR 5/8) and dark brown (7.5YR 3/2) Fe-Mn concretions; gradual smooth boundary.

C_1, (52-61"), 18127 -- Yellowish brown (10YR 5/4-6/4) friable silt loam; massive; few roots; occasional worm burrow; diffuse wavy boundary to Farmdale loess below.

Lab. no.	Depth, in.	Horizon	Particle size distribution of < 2 mm. (in mm.) (%)							Pores		Hydraulic conductivity, in./hr.	Moisture	
			Sand	Silt			Clay							
			Total 2-.050	Coarse .050-.020	Fine .020-.002	Total .050-.002	Coarse .002-.0002	Fine < .0002	Total < .002	Capillary, %	Noncapillary, %		1/3 atmos., %	15 atmos., %
18120	0-10	A1	2.7	33.1	38.0	71.1	12.1	11.9	24.0				29.8	14.2
18121	10-16	A3	1.7	33.1	37.6	70.7	11.4	15.1	26.5				30.5	11.1
18122	16-22	B1	1.8	32.2	36.4	68.6	14.1	14.3	28.4				32.2	11.7
18123	22-29	B21	2.2	32.9	32.3	65.2	15.1	16.1	31.2	42.4	9.9	1.11	32.1	13.0
18124	29-34	B22	4.2	32.8	31.3	64.1	14.0	18.3	32.3				33.0	14.0
18125	34-43	B23	1.8	32.6	33.6	66.2	14.0	18.1	32.1	43.0	8.7	.83	35.8	15.5
18126	43-52	B3	2.3	36.0	34.0	70.0	10.8	15.1	25.9				34.8	12.4
18127	52-61	C1	3.0	34.9	39.2	74.1	7.4	14.8	22.2	40.6	4.6	.47	30.9	9.7

Lab. no.	Exch. cations me./100g. soil				Exch. Ca / Exch. Mg	Cation exch. cap., me./100g.	Base saturation, %	pH 1:1 ratio	$CaCO_3$ equiv., %	Organic carbon, %	Bulk density	Soil tests lb. per acre		
	Ca	Mg	K	Na								P_1	P_2	K
18120	11.2	4.8	.2	.1	2.3	20.3	83	6.0		3.06		10	14	232
18121	6.2	3.1	.2	.1	2.0	17.5	56	5.0		1.46		10	10	232
18122	7.2	3.9	.3	.2	1.8	18.9	61	4.9		1.10		10	12	240
18123	9.4	4.4	.3	.2	2.1	21.5	73	5.0		.80	1.26	42	59	277
18124	10.8	6.4	.4	.2	1.7	23.0	79	5.1		.59		104	157	299
18125	11.6	7.1	.4	.2	1.6	23.1	83	5.1		.44	1.33	120	181	300
18126	10.5	6.5	.4	.2	1.6	22.7	80	5.3		.43		107	200	300
18127	8.7	5.2	.3	.2	1.7	15.3	95	5.5		.26	1.50	83	200	248

Profile No. 22 — Tama Silt Loam (36)

Carroll County, T.24N., R.6E., Sec. 23, SE160, SE40, SE10

Sampled in roadside bluegrass sod on 5-percent slope to southwest, 516 feet west of road corner, 16 miles east from Mississippi River bluff. Parent material is Peorian loess 8½ feet thick, all noncalcareous. Native vegetation was tall-grass prairie. On-site description written and samples taken in 1956. Description and data included in thesis of A. H. Reimer (1957).

A_1, (0-10"), 17866 -- Very dark brown to black (10YR 2/2-2/1) friable silt loam; moderate fine crumb; many fibrous roots; clear smooth boundary.

A_3, (10-14"), 17867 -- Very dark grayish brown (10YR 3/2) friable silt loam; moderate medium to coarse granular to crumb; clear smooth boundary.

B_1, (14-20"), 17868 -- Dark yellowish brown to dark brown (10YR 3/4-3/3) friable heavy silt loam; weak fine subangular blocky; few light brownish gray (10YR 6/2 dry) coatings which disappear when moistened; numerous channels filled with partially decomposed roots; clear smooth boundary.

B_{21}, (20-26"), 17869 -- Dark brown (10YR 4/3) friable to slightly firm light silty clay loam; abundant gray coatings when dry; clear smooth boundary.

B_{22}, (26-37"), 17870 -- Dark yellowish brown to yellowish brown (10YR 4/4-5/4) 70% slightly firm silty clay loam; 30% fine faint to distinct brown (10YR 5/3) mottles; moderate medium subangular blocky; light brownish gray (10YR 6/2) coatings are very pronounced when dry; numerous very dark gray (N 3/0) to dark brown (7.5YR 3/2) Mn concretions and some strong (7.5YR 5/8) Fe concretions; many ant channels; clear smooth boundary.

B_{23}, (37-45"), 17871 -- Dominantly light yellowish brown to brownish yellow (10YR 6/5) friable to slightly firm silt loam; yellowish brown (10YR 5/4) fine faint mottles and light brownish gray to pale brown (10YR 6/2) fine distinct mottles; weak to moderate coarse subangular blocky; many dark brown to dark yellowish brown (10YR 4/3-4/4) clay films; numerous small dark brown (7.5YR 3/2) Mn concretions and a few strong brown (7.5YR 5/8) Fe concretions; gradual smooth boundary.

B_3, (45-55"), 17872 -- Dominantly yellowish brown to brown (10YR 5/4-4/3) friable silt loam; 1/8-1/4" lenticular-like stratifications of light yellowish brown to brown (10YR 6/4-5/3); few light brownish gray to pale brown (10YR 6/2-6/3) fine distinct mottles; weak coarse angular blocky approaching massive; gradual smooth boundary.

C_1, (55-100"), 17873 -- Yellowish brown to brown (10YR 5/4-4/3) friable silt loam; nearly massive though stratification still evident but not as distinct as in the B_3 above; clear smooth boundary to Farmdale loess below.

Lab. no.	Depth, in.	Horizon	Particle size distribution of < 2 mm. (in mm.) (%)							Pores		Hydraulic conductivity, in./hr.	Moisture	
			Sand	Silt			Clay			Capillary, %	Non-capillary, %		⅓ atmos., %	15 atmos., %
			Total 2-.050	Coarse .050-.020	Fine .020-.002	Total .050-.002	Coarse .002-.0002	Fine < .0002	Total < .002					
17866	0-10	A1	3.8	38.1	35.1	73.2	11.9	11.1	23.0	36.9	18.9	3.46	32.2	12.3
17867	10-14	A3	3.8	37.1	35.1	72.2	12.2	11.8	24.0				29.7	10.3
17868	14-20	B1	3.8	36.9	34.1	71.0	12.6	12.6	25.2	39.9	11.8	1.15	31.5	10.9
17869	20-26	B21	4.2	35.3	31.7	67.0	13.4	15.4	28.8				33.4	13.7
17870	26-37	B22	4.5	38.7	27.5	66.2	13.5	15.8	29.3	42.0	9.7	1.40	32.8	14.5
17871	37-45	B23	3.4	38.9	29.2	68.1	13.0	15.5	28.5				35.9	14.7
17872	45-55	B3	2.7	38.1	31.7	69.8	12.7	14.8	27.5	42.2	4.9	.11	34.3	13.0
17873	55-100	C1	2.6	45.1	31.7	76.8	9.0	11.6	20.6	41.3	5.0	.05	30.8	9.4

Lab. no.	Exch. cations me./100g. soil				Exch. Ca / Exch. Mg	Cation exch. cap., me./100g.	Base saturation, %	pH 1:1 ratio	$CaCO_3$ equiv., %	Organic carbon, %	Bulk density	Soil tests lb. per acre		
	Ca	Mg	K	Na								P_1	P_2	K
17866	8.2	5.3	.44	.25	1.6	17.4	81	6.1		2.04	1.09	13	16	300
17867	5.5	1.8	.19	.20	3.1	12.5	62	5.2		1.03		10	14	200
17868	5.8	2.6	.19	.12	2.2	13.6	64	5.2		.71	1.24	10	14	200
17869	6.6	4.6	.27	.18	1.4	15.3	77	5.1		.48		20	34	217
17870	6.7	5.9	.28	.21	1.1	15.7	83	5.2		.25	1.31	94	144	235
17871	7.6	6.4	.27	.20	1.2	16.1	90	5.3		.21		100	200+	254
17872	8.7	7.5	.31	.25	1.2	18.5	91	5.3		.18	1.46	89	200+	235
17873	7.4	5.0	.23	.24	1.5	14.0	93	5.6		.13	1.49	47	200+	192

Profile No. 23 — Tama Silt Loam (36)

Warren County, T.10N., R.3W., Sec. 5, NW160, NE40, NW10

Sampled in cultivated field, 2 to 3 rods below crest of ridge, on 4-percent slope to north and northeast, 40 feet south of center of blacktop road, 30 feet east of farmstead yard fence, and 11 miles east southeast from Mississippi River bluff. Parent material is Peorian loess 12 feet thick, calcareous at a depth of 69 inches. Native vegetation was tall-grass prairie, but sampling site is adjacent to forested steeper slopes. On-site description written and samples collected in 1965.

Ap, (0-6"), 20035 -- Very dark brown (10YR 2/2) friable silt loam; weak fine to medium granular; pH 7.0; abrupt smooth boundary.

A_3, (6-9"), 20036 -- Very dark grayish brown (10YR 3/2) friable silt loam; weak to moderate fine granular; thin patchy light gray (10YR 7/1 dry) silt coatings; pH 6.0; clear smooth boundary.

B_1, (9-15"), 20037 -- Dark brown (10YR 3/3) slightly firm light silty clay loam; thin patchy light gray (10YR 7/1 dry) silt coatings; moderate very fine subangular blocky; pH 5.9; clear smooth boundary.

B_{21}, (15-20"), 20038 -- Dark yellowish brown (10YR 4/4) firm silty clay loam; moderate fine subangular blocky; pH 5.8; clear smooth boundary.

B_{22}, (20-25"), 20039 -- Dark yellowish brown (10YR 4/4) firm silty clay loam; moderate fine subangular blocky; brown (10YR 4/3) dull thin continuous clay coatings; pH 5.7; clear smooth boundary.

B_{23}, (25-33"), 20040-1 -- Dark yellowish brown (10YR 4/4-5/4) firm silty clay loam; weak to moderate fine prismatic breaking to moderate fine to medium subangular blocky; brown (10YR 4/3) dull thin continuous clay coatings; many very fine Fe-Mn concretions; pH 5.7; clear smooth boundary.

B_{31}, (33-40"), 20042-3 -- Yellowish brown (10YR 5/4 and 5/6) slightly firm light silty clay loam; many fine to medium distinct grayish brown (10YR 5/2) mottles; weak medium to coarse subangular to angular blocky; brown (10YR 4/3) dull thin discontinuous clay coatings; many very fine Fe-Mn concretions; pH 5.8; gradual smooth boundary.

B_{32}, (40-48"), 20044-5 -- Brown (10YR 5/3) friable light silty clay loam; many fine to medium distinct light brownish gray (2.5Y 6/2) mottles; very weak coarse subangular and angular blocky; many fine Fe-Mn concretions; pH 6.0; diffuse smooth boundary.

C_1, (48-59"), 20046-7 -- Brown (10YR 5/3) friable heavy silt loam; many fine to medium distinct grayish brown (2.5Y 5/2) mottles; massive; many fine Fe-Mn concretions; pH 6.5; diffuse smooth boundary.

C_2, (59-69"), 20048-9 -- Light brownish gray (2.5Y 6/2) friable silt loam; many fine distinct yellowish brown (10YR 5/4) mottles; massive; many fine Fe-Mn concretions; pH 6.8; gradual smooth boundary.

C_3, (69-76"), 20050-1 -- Light brownish gray (2.5Y 6/2) friable silt loam; many fine distinct yellowish brown (10YR 5/4) mottles; massive; many fine Fe-Mn concretions; calcareous; gradual smooth boundary.

C_4, (76-88"), 20052-3 -- Light brownish gray (2.5Y 6/2) friable silt loam; many fine distinct yellowish brown (10YR 5/4) mottles; massive; many fine Fe-Mn concretions; calcareous; gradual smooth boundary.

C_5, (88-98"), 20054-5 -- Light brownish gray (2.5Y 6/2) friable silt loam; many fine distinct yellowish brown (10YR 5/4 and 5/6) mottles; massive; many fine to medium Fe-Mn concretions; a few snail shells and fragments; calcareous; gradual smooth boundary.

C_6, (98-110"), 20056-7 -- Grayish brown (2.5Y 5/2-6/2) friable silt loam; common fine distinct yellowish brown (10YR 5/4) mottles; massive; many fine to medium Fe-Mn concretions; snail shells and fragments present; more compact than above; calcareous; gradual smooth boundary.

C_7, (110-119"), 20058-9 -- Grayish brown (2.5Y 5/2-6/2) to light gray (2.5Y 6/1) friable silt loam; common fine distinct yellowish brown (10YR 5/4) mottles; massive but thinly laminated; many fine to medium Fe-Mn concretions; snail shells and fragments present; same compaction as C_6 above; many long roughly horizontal Fe streakings; calcareous; gradual smooth boundary.

C_8, (119-128"), 20060-1 -- Grayish brown (2.5Y 5/2) friable silt loam; common fine distinct yellowish brown (10YR 5/4) mottles; massive; many fine Fe-Mn concretions; snail shells and fragments present; moderately compact; some thin lateral Fe streaks; calcareous; gradual smooth boundary.

C_9, (128-135"), 20062-3 -- Grayish brown (2.5Y 5/2 and 5/1) friable silt loam; few fine distinct yellowish brown (10YR 5/4) mottles; massive; many fine Fe-Mn concretions; snail shells and fragments present; moderately compact; some thin lateral Fe streaks; calcareous; gradual smooth boundary.

C_{10}, (135-137"), 20064 -- Mixed 50% grayish brown (2.5Y 5/2) and 50% yellowish brown (10YR 5/4 and 5/6) silt loam; massive; many fine Fe-Mn concretions; moderately compact; some thin lateral Fe streaking; calcareous; gradual smooth boundary.

C_{11}, (137-145"), 20065-6 -- Grayish brown (2.5Y 5/2) to light grayish brown (2.5Y 6/2) silt loam; common fine to medium distinct yellowish brown (10YR 5/4 and 5/6) mottles; massive; many fine Fe-Mn concretions; calcareous; extremely irregular wavy boundary to probable Farmdale loess below.

Lab. no.	Depth, in.	Horizon	Particle size distribution of < 2 mm. (in mm.) (%) Sand Total 2-.050	Silt Coarse .050-.020	Silt Fine .020-.002	Silt Total .050-.002	Clay Coarse .002-.0002	Clay Fine < .0002	Clay Total < .002	Pores Capillary, %	Pores Non-capillary, %	Hydraulic conductivity, in./hr.	Moisture ⅓ atmos., %	Moisture 15 atmos., %
20035	0-6	Ap	2.6	47.4	31.7	79.1	9.8	8.5	18.3				27.9	11.1
20036	6-9	A3	2.0	46.1	31.4	77.5	9.8	10.7	20.5				26.2	8.9
20037	9-15	B1	1.9	44.7	28.7	73.4	11.2	13.5	24.7				26.5	10.7
20038	15-20	B21	2.2	42.5	29.2	71.7	11.5	14.6	26.1				28.2	12.4
20039	20-25	B22	2.2	39.5	30.3	69.8	13.2	14.8	28.0				32.2	15.0
20040	25-29	B23	1.9	34.0	34.6	68.6	14.3	15.2	29.5				34.3	17.4
20041	29-33	B23	2.0	33.3	34.1	67.4	14.0	16.6	30.6				36.1	18.4
20042	33-37	B31	2.2	38.6	32.2	70.8	12.5	14.5	27.0				34.0	15.4
20043	37-40	B31	2.2	38.3	32.5	70.8	12.0	15.0	27.0				34.8	16.4
20044	40-44	B32	2.2	36.8	33.4	70.2	11.7	15.9	27.6				34.6	15.7
20045	44-48	B32	1.6	29.1	39.3	68.4	13.9	16.1	30.0				34.6	15.8
20046	48-53	C1	2.5	37.2	34.8	72.0	11.3	14.2	25.5				33.4	13.0
20047	53-59	C1	2.0	38.1	35.2	73.3	10.0	14.7	24.7				33.6	12.4
20048	59-64	C2	1.6	37.1	36.4	73.5	10.1	14.8	24.9				33.9	12.3
20049	64-69	C2	1.4	33.1	40.7	73.8	10.1	14.7	24.8				34.0	12.7
20050	69-73	C3	1.4	37.0	37.6	74.6	10.3	13.7	24.0				34.2	11.8
20051	73-76	C3	1.5	39.4	39.2	78.6	9.8	10.1	19.9				32.4	10.2
20052	78-82	C4	1.7	37.7	41.3	79.0	9.4	9.9	19.3					
20053	82-88	C4	1.7	37.9	39.7	77.6	9.7	11.0	20.7					
20054	88-93	C5	1.8	43.6	36.9	80.5	7.3	10.4	17.7					
20055	93-98	C5	1.7	43.2	38.6	81.8	7.1	9.4	16.5					
20056	98-105	C6	1.5	45.4	37.0	82.4	7.7	8.4	16.1					
20057	105-110	C6	1.6	46.2	37.6	83.8	7.8	6.8	14.6					
20058	110-115	C7	2.5	45.6	36.7	82.3	7.8	7.4	15.2					
20059	115-119	C7	2.6	44.2	37.6	81.8	7.8	7.8	15.6					
20060	119-124	C8	2.0	47.0	34.9	81.9	8.0	8.1	16.1					
20061	124-128	C8	1.9	48.1	34.5	82.6	7.4	8.1	15.5					
20062	128-132	C9	2.1	47.8	34.3	82.1	7.9	7.9	15.8					
20063	132-135	C9	1.4	42.4	40.6	83.0	7.5	8.1	15.6					
20064	135-137	C10	1.6	49.2	33.8	83.0	7.8	7.6	15.4					
20065	137-141	C11	1.4	43.6	39.8	83.4	8.1	7.1	15.2					
20066	141-145	C11	1.7	41.7	40.1	81.8	6.8	9.7	16.5					

Lab. no.	Exch. cations me./100g. soil				Exch. Ca / Exch. Mg	Cation exch. cap., me./100g.	Base saturation, %	pH 1:1 ratio	CaCO₃ equiv., %	Organic carbon, %	Bulk density	Soil tests lb. per acre		
	Ca	Mg	K	Na								P₁	P₂	K
20035	12.5	3.7	.31	.09	3.4	17.1	97	6.5		2.21		78	85	268
20036	9.5	2.9	.25	.10	3.3	15.0	85	5.8		1.14		32	37	241
20037	10.0	3.8	.31	.11	2.6	17.5	81	5.8		.83		27	35	284
20038	10.1	4.8	.34	.12	2.1	10.9	81	5.6		.73		23	30	303
20039	11.0	5.7	.50	.15	1.9	21.4	81	5.2		.57		34	47	400+
20040	12.0	6.5	.60	.16	1.8	23.2	83	5.2		.30		78	103	400+
20041	12.9	9.5	.66	.18	1.7	24.7	86	5.1		.34		90	125+	400
20042	11.8	6.8	.53	.16	1.7	22.5	86	5.3		.34		87	125+	400+
20043	11.8	6.9	.54	.17	1.7	21.9	88	5.4		.38		85	125+	400+
20044	12.5	7.3	.56	.18	1.7	22.8	90	5.4		.30		82	125+	400+
20045	13.3	8.1	.54	.19	1.7	24.7	89	5.5		.27		78	125+	400+
20046	11.3	6.8	.54	.19	1.7	20.9	90	5.7		.27		66	125+	400+
20047	11.4	6.9	.58	.20	1.7	20.7	92	5.7		.23		62	125+	400+
20048	11.5	7.1	.55	.24	1.6	20.5	95	5.9		.19		53	125+	400+
20049	12.0	7.7	.56	.23	1.6	21.1	96	6.3		.19		49	125+	400+
20050								6.9		.19		32	125+	400+
20051								7.8	10.0	.09		7	125+	400+
20052								7.9	12.0	.09		6	125+	400+
20053								8.0	10.0	.13		6	125+	342
20054								8.0	14.0	.13		7	125+	300
20055								8.1	13.0	.09		8	125+	303
20056								8.2	14.0	.09		9	125+	284
20057								8.2	16.0	.06		8	125+	222
20058								8.2	13.0	.09		9	125+	245
20059								8.0	11.0	.09		8	125+	264
20060								8.0	15.0	.09		9	125+	272
20061								8.0	11.0	.09		11	125+	268
20062								7.9	13.0	.13		9	125+	288
20063								8.0	15.0	.21		9	125+	276
20064								7.9	13.0	.08		10	125+	268
20065								8.0	14.0	.11		9	125+	264
20066								7.9	12.0	.15		10	125+	256

Profile No. 24 — Tama Silt Loam (36)

Knox County, T.12N., R.3E., Sec. 10, SE160, SE40, NE10

Sampled in roadside sod on 5-percent slope to southwest, about 65 rods north of corner of paved road, and 38 miles east from Mississippi River bluff. Parent material is Peorian loess seven feet thick, all noncalcareous. Native vegetation was tall-grass prairie. Samples were collected in 1930. Description was written in 1961 near sampling site.

A_{11}, (0-6"), 13915 -- Very dark brown (10YR 2/2) friable silt loam; moderate fine crumb; clear smooth boundary.

A_{12}, (6-10"), 13916 -- Very dark grayish brown (10YR 3/2) friable light silty clay loam; moderate medium granular; clear smooth boundary.

A_3, (10-13"), 13917 -- Dark brown to dark grayish brown (10YR 3/3-4/2) slightly firm silty clay loam; moderate medium to coarse granular; clear smooth boundary.

B_1, (13-18"), 13918 -- Dark brown (10YR 4/3) firm silty clay loam; moderate fine subangular blocky; clear smooth boundary.

B_{21}, (18-29"), 13919 -- Brown (10YR 4/3) firm silty clay loam; moderate medium subangular blocky; thin discontinuous light brownish gray (10YR 6/2 dry) silt coatings; clear smooth boundary.

B_{22}, (29-35"), 13920 -- Brown (10YR 4/3-5/3) firm silty clay loam; thin discontinuous dark brown (7.5YR 4/3) clay coatings; clear smooth boundary.

B_{31}, (35-41"), 13921 -- Brown (10YR 5/3) firm silty clay loam; few fine faint light brownish gray (10YR 6/2) mottles; weak coarse angular blocky; thin discontinuous dark brown (7.5YR 4/3) clay coatings; clear smooth boundary.

B_{32}, (41-53"), 13922 -- Brown (10YR 5/3) firm heavy silt loam; few fine faint light brownish gray to pale brown (10YR 6/2-6/3) mottles; very weak coarse angular blocky; thin discontinuous brown (7.5YR 4/3-5/3) clay coatings; gradual smooth boundary.

C_1, (53-71"), 13923-4 -- Yellowish brown (10YR 5/4) friable silt loam; few fine faint pale brown (10YR 6/3) mottles; massive; gradual smooth boundary.

C_2, (71-86"), 13925 -- Yellowish brown (10YR 5/4) friable silt loam; massive; abrupt smooth boundary to Farmdale loess below.

Lab. no.	Depth, in.	Horizon	Particle size distribution of < 2 mm. (in mm.) (%)							Pores		Hydraulic conductivity, in./hr.	Moisture	
			Sand	Silt			Clay			Capillary, %	Non-capillary, %		⅓ atmos., %	15 atmos., %
			Total 2-.050	Coarse .050-.020	Fine .020-.002	Total .050-.002	Coarse .002-.0002	Fine < .0002	Total < .002					
13915	0-6	A11	2.4			71.1			26.5					
13916	6-10	A12	1.0			69.3			29.7					
13917	10-13	A3	.8			67.6			31.6					
13918	13-18	B1	.8			66.2			33.0					
13919	18-29	B21	.6			65.6			33.8					
13920	29-35	B22	.7			67.8			31.5					
13921	35-41	B31	.8			71.0			28.2					
13922	41-53	B32	.7			73.3			26.0					
13923	53-61	C1	.8			75.9			23.3					
13924	61-71	C1	.7			75.6			23.7					
13925	71-86	C2	.4			81.5			18.1					

Lab. no.	Exch. cations me./100g. soil				Exch. Ca / Exch. Mg	Cation exch. cap., me./100g.	Base saturation, %	pH 1:1 ratio	$CaCO_3$ equiv., %	Organic carbon, %	Bulk density	Soil tests lb. per acre		
	Ca	Mg	K	Na								P_1	P_2	K
13915	9.5	3.2	.43	.09	3.0	18.5	79	5.4		2.38				
13916	8.4	3.6	.44	.11	2.3	18.0	76	5.4		1.80				
13917						18.8	70	5.2		1.44				
13918	8.4	4.7	.38	.16	1.8	20.2	72	5.2		1.11				
13919	9.8	5.9	.38	.19	1.7	22.2	79	5.2		.64				
13920	10.1	6.0	.38	.23	1.7	21.4	83	5.2		.42				
13921	9.9	6.1	.35	.21	1.6	19.0	87	5.5		.31				
13922	9.0	5.8	.33	.23	1.6	17.4	94	5.8		.22				
13923	7.9	5.4	.28	.21	1.5	15.5	99	6.0		.17				
13924	9.3	5.5	.29	.22	1.7	15.7	98	6.3		.17				
13925	7.8	4.6	.22	.18	1.7	12.5	100	6.7		.16				

Profile No. 25 — Muscatine Silt Loam (41)

Carroll County, T.25N., R.7E., Sec. 21, SE160, SW40, SE10

Sampled in roadside bluegrass sod on 1-percent slope to northeast and to west, 29 rods west of quarter-mile line fence which is one-quarter mile west of Ogle-Carroll county line, 21 miles east northeast from Mississippi River bluff. Parent material is Peorian loess 12 feet thick, calcareous at a depth of 85 inches. Native vegetation was tall-grass prairie. On-site description written and samples taken in 1957.

A_{11}, (0-14"), 18082-3 -- Black (10YR 2/1) friable silt loam; moderate medium to coarse crumb or soft granular; abundant fibrous roots; gradual smooth boundary.

A_{12}, (14-18"), 18084 -- Black (10YR 2/1) crushes to very dark brown (10YR 2/2) friable silt loam; moderate coarse soft granular to fine subangular blocky; fibrous roots abundant; clear smooth boundary.

A_3, (18-21"), 18085 -- Black (10YR 2/1) crushes to very dark brown (10YR 2/2-3/2) friable silt loam; moderate fine subangular blocky; some faint grayish (10YR 5/2 dry) speckings on structure faces; fibrous roots common; clear smooth boundary.

B_{21}, (21-27"), 18086 -- Dark grayish brown (10YR 4/2) friable silty clay loam; mottled few yellowish brown (10YR 5/4); moderate fine to medium subangular blocky; grayish (10YR 5/2 dry) speckings and coatings; worm-burrow fillings of very dark grayish brown (10YR 3/2) material; fibrous roots common; some fine Fe-Mn concretions; some open worm burrows through the horizon; clear smooth boundary.

B_{22}, (27-36"), 18087 -- Brown (10YR 5/3) firm silty clay loam; mottled few yellowish brown (10YR 5/8); moderately strong fine to medium subangular blocky; few faint dark gray (10YR 4/1) coatings; roots few; small Fe concretions common; worm burrows few; gradual smooth boundary.

B_{23}, (36-41"), 18088 -- Grayish brown to brown (10YR 5/2-5/3) friable light silty clay loam; mottled many yellowish brown (10YR 5/8) and strong brown (7.5YR 5/8); weak medium subangular blocky to fragmental; roots few; Fe-Mn concretions few; worm burrows few; clear smooth boundary.

B_3, (41-55"), 18089 -- Gray to light brownish gray (10YR 6/1-6/2) mixed and mottled (40%) yellowish brown to strong brown (10YR 5/8-7.5YR 5/8) and (10%) yellowish brown (10YR 5/4) friable light silty clay loam borderline to heavy silt loam; very weak very coarse angular blocky; Fe-Mn concretions common; worm burrows few; clear smooth boundary.

C_1, (55-70"+), 18090-1 -- Mixed 50% gray to light brownish gray (10YR 6/1-6/2), 40% yellowish brown (10YR 5/8) to strong brown (7.5YR 5/8), 5% yellowish brown (10YR 5/6) and 5% dark yellowish brown (10YR 3/4) friable silt loam; massive; few distinct Fe-Mn concretions; a few worm burrows; a single krotovina noted and traced to a depth of 60".

Lab. no.	Depth, in.	Horizon	Particle size distribution of < 2 mm. (in mm.) (%)							Pores		Hydraulic conductivity, in./hr.	Moisture	
			Sand	Silt			Clay			Capillary, %	Noncapillary, %		⅓ atmos., %	15 atmos., %
			Total 2-.050	Coarse .050-.020	Fine .020-.002	Total .050-.002	Coarse .002-.0002	Fine < .0002	Total < .002					
18082	0-7	A11	3.2	31.0	37.5	68.5	11.1	16.5	27.6	43.7	16.7	10.52	39.2	23.6
18083	7-14	A11	2.8	32.0	36.2	68.2	11.2	16.8	28.0				44.7	17.7
18084	14-18	A12	3.1	32.1	35.6	67.7	11.1	17.0	28.1				39.3	14.6
18085	18-21	A3	3.6	34.1	33.8	67.9	11.3	16.4	27.7				35.5	13.0
18086	21-27	B21	3.8	32.6	31.0	63.6	13.4	17.1	30.5	38.7	10.8	3.16	35.1	14.4
18087	27-36	B22	4.1	32.9	30.5	63.4	15.4	16.8	32.2	39.1	8.5	4.71	40.0	15.5
18088	36-41	B23	4.5	36.3	29.2	65.5	15.6	13.1	28.7				36.6	13.8
18089	41-55	B3	3.6	34.7	32.2	66.9	16.0	11.9	27.9				36.9	14.5
18090	55-62	C1	2.9	39.2	32.2	71.4	12.9	11.9	24.8				35.1	12.2
18091	60-70+	C1	2.9	39.3	32.8	72.1	10.9	12.5	23.4	45.8	4.1	.08	32.9	12.2

Lab. no.	Exch. cations me./100g. soil				Exch. Ca / Exch. Mg	Cation exch. cap., me./100g.	Base saturation, %	pH 1:1 ratio	$CaCO_3$ equiv., %	Organic carbon, %	Bulk density	Soil tests lb. per acre		
	Ca	Mg	K	Na								P_1	P_2	K
18082	15.7	4.6	.45	.20	3.4	33.5	63	5.3		5.90	.94	10	12	300+
18083	16.4	4.5	.25	.20	3.6	31.5	69	5.5		4.10		11	11	254
18084	12.9	5.0	.24	.20	2.6	27.2	66	5.5		2.62		10	10	254
18085	11.5	5.1	.28	.20	2.3	24.0	72	5.4		1.66		10	10	254
18086	11.6	5.9	.33	.20	2.0	24.1	76	5.3		.83	1.19	11	11	264
18087	12.6	8.0	.41	.20	1.6	26.2	77	5.2		.56	1.25	14	18	274
18088	11.6	7.9	.39	.20	1.5	23.5	92	5.4		.31		48	69	285
18089	12.8	8.7	.34	.20	1.5	23.5	97	6.1		.20		77	174	244
18090	12.4	8.5	.26	.20	1.5	21.2	100+	6.3		.07		40	200+	177
18091	11.8	8.0	.24	.20	1.5	19.8	100+	6.7		.05	1.41	28	196	156

Profile No. 26 — Muscatine Silt Loam (41)

Winnebago County, T.26N., R.10E., Sec. 36, NW160, NW40, NW10

Sampled in cultivated field on 1-percent slope to south, 450 feet east of center of blacktop (Hoisington) road, 222 feet south of center of gravel road, two feet east of field fence, 41 miles east northeast from Mississippi River bluff, and seven miles northwest of Rock River. Parent material is Peorian loess nine feet thick, calcareous at a depth of 75 inches. Native vegetation was tall-grass prairie. On-site description written and samples collected in 1957.

Ap, (0-6"), 18102 -- Black (10YR 2/1) crushes very dark brown (10YR 2/2) friable silt loam; weak medium soft granular; fibrous roots common; pH 6.0; abrupt smooth boundary.

A_{12}, (6-11"), 18103 -- Black (10YR 2/1) crushes to very dark brown (10YR 2/2) friable silt loam; weak thin platy in place breaking to weak fine to medium crumb; fibrous roots common; pH 6.0; clear smooth boundary.

A_3, (11-16"), 18104 -- Very dark brown (10YR 2/2) crushes to very dark grayish brown (10YR 3/2) friable silt loam; weak medium platy in place breaking to weak medium crumb to very weak fine subangular blocky; fibrous roots common; worm burrows common; few small Fe-Mn concretions; pH 6.0; gradual smooth boundary.

B_1, (16-22"), 18105 -- Dark brown (10YR 3/3) friable light silty clay loam borderline to silt loam; weak fine subangular blocky; thin grayish (10YR 8/2 dry) speckings; fibrous roots common; worm burrows common; Fe-Mn concretions few; pH 5.9; gradual smooth boundary.

B_{21}, (22-28"), 18106 -- Dark grayish brown (10YR 4/2) firm silty clay loam; moderate fine subangular blocky specked faint thin light gray to white (10YR 8/2 dry); few roots; few worm burrows; small Fe-Mn concretions common; pH 5.8; clear smooth boundary.

B_{22}, (28-33"), 18107 -- Dark grayish brown (10YR 4/2) mottled few fine faint yellowish brown (10YR 5/6 and 5/8) firm silty clay loam; moderate fine subangular blocky; grayish to white (10YR 8/2 dry) speckings fewer and less distinct than above; few roots; few worm burrows; few Fe-Mn concretions and occasional splotches of dark reddish brown (5YR 3/2); clear smooth boundary.

B_{23}, (33-40"), 18108 -- Grayish brown to light grayish brown (10YR 5/2-6/2) mottled many fine distinct yellowish brown to brownish yellow (10YR 5/8-6/6) firm light silty clay loam; moderate fine to medium subangular blocky; clay films of grayish brown (10YR 5/2); few roots; few worm burrows; many fine distinct dark reddish brown (5YR 3/2) Fe-Mn splotches and concretions; pH 5.8; gradual smooth boundary.

B_3, (40-46"), 18109 -- Grayish brown (2.5Y 5/2) firm light silty clay loam; many fine distinct yellowish brown to brownish yellow (10YR 5/8-6/6) mottles; moderate coarse subangular to angular blocky; continuous thick dark grayish brown (2.5Y 4/2) clay films; few roots; occasional worm burrow; many dark reddish brown Fe-Mn splotches and concretions; pH 5.9; clear wavy boundary.

C_1, (46-75"), 18110 -- Mixed or varigated light brownish gray, grayish brown, and yellowish brown (10YR 6/2, 5/2, 5/8 and 5/6) friable silt loam; massive; numerous threadlike channels and some larger burrows filled with very dark brown (10YR 2/2); an occasional crack or large area filled with grayish brown (2.5Y 5/2); pH 6.5; abrupt smooth boundary.

C_2, (75-110"), 18111 -- Yellowish brown (10YR 5/4) friable silt loam; mottled common faint yellowish brown (10YR 5/6); massive; calcareous; clear smooth boundary to Farmdale loess below.

Lab. no.	Depth, in.	Horizon	Particle size distribution of < 2 mm. (in mm.) (%)							Pores		Hydraulic conductivity, in./hr.	Moisture	
			Sand	Silt			Clay			Capillary, %	Noncapillary, %		⅓ atmos., %	15 atmos., %
			Total 2-.050	Coarse .050-.020	Fine .020-.002	Total .050-.002	Coarse .002-.0002	Fine < .0002	Total < .002					
18102	0-6	Ap	2.7	29.8	40.5	70.3	12.1	14.2	26.3				31.3	12.5
18103	6-11	A12	2.5	30.5	40.0	70.5	12.2	14.0	26.2	38.5	14.3	4.12	30.9	12.7
18104	11-16	A3	3.1	29.1	39.9	69.0	13.2	13.9	27.1				33.6	11.0
18105	16-22	B1	3.4	31.3	36.8	68.1	14.2	14.3	28.5				34.4	11.8
18106	22-28	B21	2.7	29.3	32.7	62.0	13.7	20.6	34.3				34.2	14.8
18107	28-33	B22	2.2	30.3	31.5	61.8	14.5	19.8	34.3	41.1	9.0	2.57	36.4	15.2
18108	33-40	B23	2.0	33.1	32.2	65.3	12.4	18.7	31.1				36.5	14.6
18109	40-46	B3	1.8	31.8	33.1	64.9	13.2	17.9	31.1	44.9	7.2	.40	35.5	14.9
18110	46-75	C1	2.3	39.4	32.9	72.3	8.4	16.0	24.4	47.9	3.2	.10	26.6	9.9
18111	75-110	C2	1.9	45.9	37.6	83.5	6.8	5.5	12.3				26.0	5.5

Lab. no.	Exch. cations me./100g. soil				Exch. Ca / Exch. Mg	Cation exch. cap., me./100g.	Base saturation, %	pH 1:1 ratio	$CaCO_3$ equiv., %	Organic carbon, %	Bulk density	Soil tests lb. per acre		
	Ca	Mg	K	Na								P_1	P_2	K
18102	9.6	4.3	.30	.20	2.2	22.7	62	5.2		2.76		23	27	300+
18103	9.3	4.3	.38	.20	2.2	22.6	64	5.8		2.42	1.11	18	18	296
18104	8.2	3.4	.30	.20	2.4	21.1	57	5.3		1.50		14	14	234
18105	8.7	4.3	.28	.20	2.0	21.2	65	5.1		1.03		13	14	244
18106	11.5	6.6	.51	.20	1.7	26.4	73	5.0		.62		24	34	300+
18107	11.2	8.0	.50	.20	1.4	26.4	75	5.1		.49	1.32	52	75	300+
18108	11.0	8.0	.53	.20	1.4	24.8	80	5.1		.47		65	107	300
18109	11.8	8.0	.53	.20	1.5	24.5	89	5.2		.34	1.34	69	128	300
18110	9.7	6.4	.28	.20	1.5	18.0	94	5.6		.24	1.45	48	200	257
18111								7.6	25.2	.16		13	168	131

Profile No. 27 — Muscatine Silt Loam (41)

Mercer County, T.13N., R.2W., Sec. 23, SE160, SE40, SE10

Sampled in cultivated field on 1-percent slope to northeast, 580 feet north of section line fence, 31 feet west of center of oiled road, 11 feet west of roadside fence, 14 miles east of Mississippi River bluff. Parent material is Peorian loess 10 feet thick, calcareous at a depth of 92 inches. Native vegetation was tall-grass prairie. On-site description written and samples taken in 1964.

Ap, (0-10"), 19606 -- Black (10YR 2/1) firm to friable silt loam; cloddy to moderate very fine granular; pH 5.5; abrupt smooth boundary.

A$_{12}$, (10-17"), 19607 -- Black (10YR 2/1) friable silt loam; moderate very fine granular; pH 5.8; clear smooth boundary.

A$_{3}$, (17-21"), 19608 -- Black (10YR 2/1) friable heavy silt loam; moderate very fine subangular blocky; pH 5.8; clear smooth boundary.

B$_{21}$, (21-26"), 19609 -- Very dark gray (10YR 3/1) firm silty clay loam; moderate very fine to fine subangular blocky; pH 5.8; clear smooth boundary.

B$_{22}$, (26-32"), 19610 -- Dark grayish brown (10YR 4/2) firm silty clay loam; few fine distinct strong brown (7.5YR 5/6) mottles; moderate very fine to fine subangular blocky; very dark gray (10YR 3/1) dull thin discontinuous clay-organic coatings; pH 6.0; clear smooth boundary.

B$_{23}$, (32-44"), 19611-2 -- Dark grayish brown (10YR 4/2) to grayish brown (10YR 5/2), firm medium silty clay loam; few fine distinct strong brown (7.5YR 5/6) mottles; weak medium prismatic breaking to moderate fine to medium angular to subangular blocky; dark gray (10YR 4/1) dull thin continuous clay-organic coatings; many fine reddish brown (5YR 4/4) and yellowish red (5YR 4/6) Fe-Mn concretions; pH 6.4; clear smooth boundary.

B$_{31}$, (44-53"), 19613 -- Grayish brown (10YR 5/2) firm light silty clay loam; common medium distinct yellowish brown (10YR 5/6) and strong brown (7.5YR 5/6) mottles; weak coarse prismatic breaking to weak medium angular blocky; very dark gray (10YR 3/1) and dark gray (10YR 4/1) dull thin discontinuous clay coatings; many fine reddish brown (5YR 4/4) and yellowish red (5YR 4/6) Fe-Mn concretions; pH 6.6; gradual smooth boundary.

B$_{32}$, (53-60"), 19614 -- Grayish brown (10YR 5/2) to light grayish brown (10YR 6/2) firm silt loam; common medium to coarse prominent yellowish brown (10YR 5/6 and 5/8) mottles; weak coarse angular blocky; very dark gray (10YR 3/1) and dark gray (10YR 4/1) dull thin discontinuous clay coatings; many fine reddish brown (5YR 4/4) and yellowish red (5YR 4/6) Fe-Mn concretions; many fine pores and root channels; pH 6.8; gradual smooth boundary.

C$_{1}$, (60-92"), 19615-8 -- Mixed yellowish brown (10YR 5/6 and 5/8), light brownish gray (10YR 6/2-2.5Y 6/2), and strong brown (7.5YR 5/6) friable silt loam; massive; black (10YR 2/1) krotovina encountered near bottom of horizon; many fine dark brown (7.5YR 3/2) and brown (7.5YR 4/4) Fe-Mn concretions; pH at 65" is 7.3; pH at 75" is 8.0; gradual smooth boundary.

C$_{2}$, (92-120"), 19619-22 -- Mixed light brownish gray (2.5Y 6/2) and yellowish brown (10YR 5/6 and 5/8) friable silt loam; massive; many fine dark brown (7.5YR 3/2) and very dark gray (10YR 3/1) Fe-Mn concretions; calcareous; abrupt smooth boundary to layer below thought to be Farmdale loess.

Lab. no.	Depth, in.	Horizon	Particle size distribution of < 2 mm. (in mm.) (%)							Pores		Hydraulic conductivity, in./hr.	Moisture	
			Sand	Silt			Clay							
			Total 2-.050	Coarse .050-.020	Fine .020-.002	Total .050-.002	Coarse .002-.0002	Fine < .0002	Total < .002	Capillary, %	Noncapillary, %		1/3 atmos., %	15 atmos., %
19606	0-10	Ap	3.8	33.9	35.1	69.0	11.5	15.7	27.2				32.0	16.7
19607	10-17	A12	2.4	32.9	35.6	68.5	10.4	18.7	29.1				32.1	16.9
19608	17-21	A3	2.7	32.0	34.9	66.9	10.4	20.0	30.4				32.8	16.2
19609	21-26	B21	3.2	31.4	34.4	65.8	11.8	19.2	31.0				32.3	16.2
19610	26-32	B22	2.7	31.0	33.6	64.6	10.9	21.8	32.7				32.3	16.2
19611	32-38	B23	2.8	28.7	34.9	63.6	13.2	20.4	33.6				33.0	20.0
19612	38-44	B23	2.5	30.8	34.5	65.3	11.7	20.5	32.2				34.4	20.6
19613	44-53	B31	2.3	31.2	36.0	67.2	11.2	19.3	30.5				35.3	17.9
19614	53-60	B32	1.8	37.9	33.0	70.9	9.6	17.7	27.3				33.3	14.3
19615	60-68	C1	1.6	38.6	34.1	72.7	9.5	16.2	25.7				32.3	11.8
19616	68-76	C1	1.6	29.7	36.4	76.1	7.6	14.7	22.3				30.7	10.9
19617	76-84	C1	1.9	41.0	35.3	76.3	8.6	13.2	21.8					
19618	84-92	C1	2.0	42.2	35.5	77.7	8.4	11.9	20.3					
19619	92-99	C2	2.4	43.8	35.5	79.3	7.1	11.2	18.3					
19620	99-106	C2	2.8	45.6	34.2	79.8	6.6	10.8	17.4					
19621	106-113	C2	1.4	37.3	43.7	81.0	7.5	10.1	17.6					
19622	113-120	C2	1.1	36.6	44.9	81.5	6.6	10.8	17.4					

Lab. no.	Exch. cations me./100g. soil				Exch. Ca / Exch. Mg	Cation exch. cap., me./100g.	Base saturation, %	pH 1:1 ratio	$CaCO_3$ equiv., %	Organic carbon, %	Bulk density	Soil tests lb. per acre		
	Ca	Mg	K	Na								P_1	P_2	K
19606	15.8	3.4	.44	.08	4.6	25.0	79	5.4		2.79		46	72	300+
19607	15.3	3.8	.49	.09	4.0	25.8	76	5.5		2.29		17	25	300+
19608	13.3	4.5	.50	.10	3.0	24.8	74	5.4		1.66		16	26	300+
19609	13.5	5.2	.45	.10	2.6	25.2	77	5.2		1.11		11	15	300+
19610	13.8	6.4	.47	.11	2.2	25.2	82	5.5		.69		12	20	300+
19611	14.7	7.6	.49	.13	1.9	26.3	87	5.9		.41		18	32	300+
19612	15.1	7.9	.53	.15	1.9	25.7	92	6.1		.40		27	58	288
19613	13.9	7.8	.50	.16	1.8	24.2	93	6.3		.23		32	120	265
19614	13.1	7.6	.46	.15	1.7	21.9	97	6.5		.12		27	130+	265
19615	11.2	6.9	.41	.15	1.6	19.1	97	6.8		.16		20	130+	217
19616	10.8	6.6	.38	.14	1.6	17.4	100	7.0		.04		16	130+	200
19617	11.5	7.1	.36	.12	1.6	17.1	100	7.4	2.0	.04		13	130+	208
19618	11.4	7.7	.33	.11	1.5	15.8	100	7.5	5.0	0		5	130+	200
19619								7.7	8.0	0		4	130+	200
19620								7.7	8.0	0		5	130+	184
19621								7.7	10.0	.08		4	130+	184
19622								7.8	11.0	.08		4	130+	158

Profile No. 28 — Muscatine Silt Loam (41)

Putnam County, T.31N., R.1W., Sec. 23, NE160, NW40, SE10

Sampled in roadside sod on 3-percent slope to west and 1-percent to north, 285 feet north of quarter-mile line, six miles east southeast from Illinois River bluff. Parent material is Peorian loess seven feet thick, calcareous at a depth of 53 inches. Native vegetation was tall-grass prairie. On-site description written and samples taken in 1954.

A_1, (0-16"), 17806 -- Black (10YR 2/1) friable heavy silt loam; fine to medium crumb with very slight tendency toward weak platy; clear smooth boundary.

A_3, (16-21"), 17807 -- Very dark gray to very dark grayish brown (10YR 3/1-3/2) friable heavy silt loam to light silty clay loam; weak medium granular; clear smooth boundary.

B_1, (21-25"), 17808 -- Very dark grayish brown to dark brown (10YR 3/2-3/3) firm silty clay loam; fine subangular blocky; clear smooth boundary.

B_2, (25-36"), 17809 -- Dark brown (10YR 3/3) 75% mottled 20% brown (10YR 4/2-4/3) and 5% grayish brown (10YR 5/2) firm silty clay loam; fine subangular blocky in upper part to well developed medium subangular blocky in lower part; faint organic-clay coatings; clear smooth boundary.

B_3, (36-47"), 17810 -- Yellowish brown (10YR 5/5) 60% mottled 30% grayish brown (10YR 5/2) and 10% yellowish brown (10YR 5/8) firm light silty clay loam; weak medium to coarse subangular blocky; thin organic-clay coatings; some Fe-Mn concretions; gradual smooth boundary.

C_1, (47-53"), 17811 -- Yellowish brown (10YR 5/6) 50% mottled 40% grayish brown (10YR 5/2) and 10% yellowish brown (10YR 5/8) friable silt loam; some Fe-Mn concretions; noncalcareous; massive; clear smooth boundary.

C_2, (53-82"), 17812-3 -- Yellowish brown (10YR 5/5) 55% mottled 35% grayish brown (10YR 5/2-6/2) and 10% yellowish brown (10YR 5/6-5/8) friable silt loam; calcareous; massive; abrupt boundary to calcareous glacial till below.

Lab. no.	Depth, in.	Horizon	Particle size distribution of < 2 mm. (in mm.) (%)							Pores		Hydraulic conductivity, in./hr.	Moisture	
			Sand	Silt			Clay			Capillary, %	Non-capillary, %		1/3 atmos., %	15 atmos., %
			Total 2-.050	Coarse .050-.020	Fine .020-.002	Total .050-.002	Coarse .002-.0002	Fine < .0002	Total < .002					
17806	0-16	A1	2.6	32.4	39.3	71.7	11.6	14.1	25.7					
17807	16-21	A3	2.2	30.4	39.4	69.8	10.2	17.8	28.0					
17808	21-25	B1	2.0	27.8	38.3	66.1	12.4	19.5	31.9					
17809	25-36	B2	2.2	32.7	32.4	65.1	8.7	24.0	32.7					
17810	36-47	B3	4.6	37.7	30.2	67.9	8.3	19.2	27.5					
17811	47-53	C1	3.2	41.3	30.7	72.0	8.3	16.5	24.8					
17812	53-68	C2	4.7	47.6	33.8	81.4	7.9	6.0	13.9					
17813	68-82	C2	5.0	58.2	27.8	86.0	5.4	3.6	9.0					

Lab. no.	Exch. cations me./100g. soil				Exch. Ca / Exch. Mg	Cation exch. cap., me./100g.	Base saturation, %	pH 1:1 ratio	$CaCO_3$ equiv., %	Organic carbon, %	Bulk density	Soil tests lb. per acre		
	Ca	Mg	K	Na								P_1	P_2	K
17806	13.0	4.3	.5	.3	3.1	21.3	84	5.8		2.54		45	60	400+
17807	9.3	6.8	.3	.3	1.4	20.4	80			1.42		21	29	284
17808	12.2	6.5	.3	.2	1.9	21.7	86			1.01		13	19	253
17809	13.3	8.0	.3	.2	1.7	23.8	92	5.3		.56		32	45	303
17810	11.3	8.1	.3	.2	1.4	20.3	97			.35		34	60	322
17811	10.4	7.9	.3	.2	1.3	17.0	100			.29		9	125+	314
17812	11.2	7.2	.2	.2	1.6	11.0	100	7.9	19.0	.17		4	125+	230
17813	21.8	3.0	.2	.3	7.3	6.7	100		27.0	.15		4	85	198

Profile No. 29 — Muscatine Silt Loam (41)

Henry County, T.16N., R.2E., Sec. 36, SE160, SW40, SW10

Sampled in cultivated field on 1-percent slope to northeast, 370 feet east of half-mile line road corner (before road was blacktopped and corner rounded), 150 feet west of gateway, 15 feet north of roadside fence, 19 miles southeast of Mississippi River bluff at Watertown, Rock Island County, and 8½ miles south from edge of Green River basin. Parent material is Peorian loess 19 feet thick, calcareous at a depth of 57 inches. Native vegetation was tall-grass prairie, chiefly Big Bluestem. On-site description written and samples collected in 1964.

Ap, (0-7"), 19630 -- Black (10YR 2/1-2/2), (10YR 2/2-3/2 crushed) friable silt loam; cloddy to moderate fine granular; pH 7.0; abrupt smooth boundary.

A_{12}, (7-14"), 19631 -- Black (10YR 2/1-2/2) friable heavy silt loam; moderate very fine to fine granular; pH 6.0; clear smooth boundary.

B_1, (14-20"), 19632 -- Very dark brown to very dark grayish brown (10YR 2/2-3/2) firm light silty clay loam; moderate fine to very fine subangular blocky; pH 6.0; clear smooth boundary.

B_{21}, (20-26"), 19633 -- Mixed very dark grayish brown and dark grayish brown (10YR 3/2 and 4/2) firm medium silty clay loam; moderate fine subangular blocky; very dark gray (10YR 3/1) shiny thin discontinuous clay coatings; pH 6.5; clear smooth boundary.

B_{22}, (26-31"), 19634 -- Dark grayish brown (10YR 4/2) firm medium to heavy silty clay loam; few fine faint brown and strong brown (7.5YR 4/4 and 5/8) mottles; moderate fine to medium subangular blocky; very dark gray to dark gray (10YR 3/1-4/1) dull thin continuous clay coatings; pH 6.5; clear smooth boundary.

B_{23}, (31-37"), 19635 -- Mixed dark grayish brown and grayish brown (10YR 4/2 and 5/2) firm medium silty clay loam; few fine distinct yellowish brown (10YR 5/8), strong brown (7.5YR 5/8), and dark brown (7.5YR 4/4) mottles; weak fine prismatic breaking to moderate medium angular blocky; dark gray (10YR 4/1) dull thin continuous clay coatings; many fine dark brown (7.5YR 3/2) Fe-Mn concretions; pH 6.5; clear smooth boundary.

B_{24}, (37-47"), 19636 -- Mixed grayish brown (10YR 5/2), light brownish gray (10YR 6/2), yellowish brown (10YR 5/8) and strong brown (7.5YR 5/8) firm medium to light silty clay loam; strong fine to medium prismatic breaking to strong medium angular blocky; dark gray to gray (10YR 4/1-5/1) dull thin continuous clay coatings; many fine dark brown (7.5YR 3/2) to very dark gray (10YR 3/1) Fe-Mn concretions; pH 7.0; clear smooth boundary.

B_3, (47-57"), 19637 -- Mixed light gray (10YR 6/1), light brownish gray (10YR 6/2), and yellowish brown (10YR 5/6 and 5/8) firm heavy silt loam to light silty clay loam; weak medium to coarse angular blocky; gray (10YR 5/1) dull thin patchy clay coatings; many fine dark brown (7.5YR 3/2) and very dark gray (10YR 3/1) Fe-Mn concretions; pH 7.8; abrupt smooth boundary.

C_1, (57-113"), 19638-44 -- Mixed 80% yellowish brown (10YR 5/6 and 5/8) and 20% light gray (2.5Y 7/2) and light brownish gray (2.5Y 6/2) friable silt loam; massive; calcareous; one snail shell found at 97-98" and another at 108"; common fine dark brown (7.5YR 3/2) and very dark gray (10YR 3/1) Fe-Mn concretions; many fine dark coated channels; abrupt smooth boundary.

C_2, (113-130"), 19645-7 -- Mixed 60% light brownish gray (2.5Y 6/2) and 40% yellowish brown (10YR 5/6 and 5/8) friable silt loam; massive; calcareous; few dark brown (7.5YR 3/3) stains; abrupt smooth boundary.

Fe band, (130-131"), 19648 -- Strong brown (7.5YR 5/6 and 5/8) friable silt loam; massive; calcareous; many coarse Fe-Mn concretions; abrupt smooth boundary.

C_3, (131-153"), 19649-51 -- Mixed 80% grayish brown (2.5Y 5/2) and light brownish gray (2.5Y 6/2) and 20% yellowish brown (10YR 5/6) friable silt loam; bands of yellowish brown (10YR 5/5); zones of coarse mottles or Fe-Mn concretions of strong brown (7.5YR 5/6 and 5/8) to brown (7.5YR 4/4); massive; calcareous; abrupt smooth boundary.

C_4, (153-157"), 19652 -- Banded 90% yellowish brown (10YR 5/4 and 5/5) and 10% grayish brown (2.5Y 5/2) friable silt loam; massive; calcareous; few snail shells and fragments; abrupt smooth boundary.

C_5, (157-161") 19653 -- Grayish brown (2.5Y 5/2-5/3) friable silt loam; few thin faint yellowish brown (10YR 5/5) bands; massive; calcareous; few snail shells and fragments; abrupt smooth boundary.

C_6, (161-174"), 19654-5 -- Yellowish brown (10YR 5/5) friable silt loam; massive; calcareous; few snail shells and fragments; abrupt smooth boundary.

C_7, (174-205"), 19656-60 -- Gray (5Y 5/1) friable silt loam; massive; calcareous; few snail shells and fragments; numerous fine very dark gray (N 3/0) Fe-Mn concretions; gradual smooth boundary.

C_8, (205-226"), 19661-3 -- Upper half dark gray (5Y 4/1) and lower half gray (5Y 5/1) friable silt loam; massive; calcareous; few very dark gray (N 3/0) Fe-Mn concretions; gradual smooth boundary to layer below interpreted as Farmdale loess.

Lab. no.	Depth, in.	Horizon	Particle size distribution of < 2 mm. (in mm.) (%)							Pores		Hydraulic conductivity, in./hr.	Moisture	
			Sand	Silt			Clay							
			Total 2-.050	Coarse .050-.020	Fine .020-.002	Total .050-.002	Coarse .002-.0002	Fine < .0002	Total < .002	Capillary, %	Non-capillary, %		⅓ atmos., %	15 atmos., %
19630	0-7	Ap	2.9	31.7	39.0	70.7	10.5	15.9	26.4				33.2	19.5
19631	7-14	A12	3.2	29.2	39.0	68.2	11.5	17.1	28.6				32.0	15.8
19632	14-20	B1	3.8	27.9	38.0	65.9	11.6	18.7	30.3				31.8	19.8
19633	20-26	B21	4.0	26.6	35.5	62.1	13.6	20.3	33.9				31.3	19.1
19634	26-31	B22	3.4	25.5	33.9	59.4	14.2	23.0	37.2				33.9	25.4
19635	31-37	B23	3.1	26.7	34.4	61.1	14.5	21.3	35.8				36.4	20.8
19636	37-47	B24	1.9	27.3	35.8	62.3	12.8	23.0	35.8				37.7	20.2
19637	47-57	B3	1.8	37.2	35.1	72.3	10.1	15.8	25.9				32.7	14.8
19638	57-65	C1	2.3	41.7	36.0	77.7	9.4	10.6	20.0				30.2	10.3
19639	65-73	C1	2.3	44.9	36.5	81.4	8.4	7.9	16.3				28.8	8.8
19640	73-81	C1	2.1	46.3	37.0	83.3	8.1	6.5	14.6					
19641	81-89	C1	2.1	47.9	36.9	84.8	7.4	5.7	13.1					
19642	89-97	C1	2.2	45.8	37.3	83.1	7.9	6.8	14.7					
19643	97-105	C1	2.6	47.1	36.8	83.9	7.6	5.9	13.5					
19644	105-113	C1	2.1	47.1	37.7	84.8	7.2	5.9	13.1					
19645	113-119	C2	2.3	46.3	35.6	81.9	7.5	8.3	15.8					
19646	119-124	C2	2.9	48.1	34.1	82.2	7.1	7.8	14.9					
19647	124-130	C2	2.2	48.8	35.0	83.8	6.7	7.3	14.0					
19648	130-131	Fe band	3.7	47.3	33.2	80.5	6.7	9.1	15.8					
19649	131-138	C3	2.7	48.0	34.3	82.3	7.2	7.8	15.0					
19650	138-145	C3	2.0	47.2	37.5	84.7	5.7	7.6	13.3					
19651	145-153	C3	1.2	49.6	37.6	87.2	5.2	6.4	11.6					
19652	153-157	C4	1.1	50.9	37.1	88.0	5.2	5.7	10.9					
19653	157-161	C5	1.0	53.0	35.7	88.7	4.4	5.9	10.3					
19654	161-167	C6	1.0	57.5	33.4	90.9	3.4	4.7	8.1					
19655	167-174	C6	.7	54.4	36.5	90.9	3.5	4.9	8.4					
19656	174-180	C7	.6	50.1	39.8	89.9	4.8	4.7	9.5					
19657	180-186	C7	.5	42.3	46.5	88.8	5.0	5.7	10.7					
19658	186-192	C7	.4	42.6	47.9	90.5	4.8	4.3	9.1					
19659	192-198	C7	1.0	42.3	46.9	89.2	6.2	3.6	9.8					
19660	198-205	C7	.8	42.1	47.1	89.2	6.4	3.6	10.0					
19661	205-212	C8	.4	39.5	49.5	89.0	5.7	4.9	10.6					
19662	212-219	C8	.6	42.8	43.8	86.6	6.0	6.8	12.8					
19663	219-226	C8	.6	33.8	52.4	86.2	6.9	6.3	13.2					

Lab. no.	Exch. cations me./100g. soil				Exch. Ca / Exch. Mg	Cation exch. cap., me./100g.	Base saturation, %	pH 1:1 ratio	$CaCO_3$ equiv., %	Organic carbon, %	Bulk density	Soil tests lb. per acre		
	Ca	Mg	K	Na								P_1	P_2	K
19630	17.8	4.4	.81	.13	4.0	23.8	97	6.6		2.86		125	130+	300+
19631	13.5	4.1	.43	.14	3.3	23.9	78	5.7		2.32		21	31	300+
19632	14.0	5.0	.44	.13	2.8	23.2	85	5.7		1.54		14	18	300+
19633	15.3	6.6	.51	.15	2.3	25.7	88	5.6		.93		8	14	300+
19634	17.2	8.3	.59	.16	2.1	29.9	88	5.7		.66		8	15	300+
19635	17.4	8.8	.55	.16	2.0	28.7	94	5.9		.51		29	52	300+
19636	18.0	9.2	.51	.20	2.0	29.0	96	6.4		.47		26	130+	288
19637								7.1		.39		9	130+	164
19638								7.6	8.0	.08		3	130+	146
19639								7.2	13.0	.20		3	130+	177
19640								7.7	17.0	0		2	130+	192
19641								7.8	18.0	0		3	97	184
19642								7.8	17.0	.12		3	74	208
19643								8.0	17.0	.17		3	68	170
19644								7.9	18.0	.17		3	81	200
19645								7.8	13.0	.12		4	120	217
19646								7.8	15.0	.23		4	111	217
19647								7.7	16.0	.16		6	111	208
19648								7.9	17.0	.28		5	27	192
19649								7.8	15.0	.12		6	130+	244
19650								7.9	21.0	.17		9	130+	244
19651								7.9	28.0	.12		5	130+	244
19652								7.9	28.0	.23		4	104	208
19653								8.0	30.0	.20		3	104	235
19654								8.0	29.0	0		3	45	164
19655								7.9	30.0	.27		3	45	192
19656								7.8	25.0	.50		4	62	200
19657								7.9	22.0	.57		4	52	226
19658								7.8	27.0	.57		4	24	208
19659								7.8	26.0	.61		4	20	208
19660								7.8	24.0	.58		6	25	217
19661								7.6	18.0	1.46		10	91	235
19662								7.7	11.0	1.02		17	130+	208
19663								7.7	16.0	.50		10	130+	152

Profile No. 30 — Sable Silty Clay Loam (68)

Warren County, T.9N., R.3W., Sec. 14, NE160, NE40, SE10

Sampled in cultivated field on 0-percent slope in broad nearly level area, 97 feet west of center of road, 39 feet north of quarter-mile line (no fence), and 16 miles east southeast of Mississippi River bluff. Parent material is Peorian loess 11 feet thick, calcareous at a depth of 47 inches. Native vegetation was principally sloughgrass *(Spartina michauxiana)*. On-site description written and samples taken in 1957.

Ap, (0-7"), 18021 -- Black (10YR 1/1-2/1) moderately friable silty clay loam; moderate fine to medium crumb to weak fine to medium granular in upper part grading to moderate medium to thick platy in lower part; pH 5.2; abrupt smooth boundary.

A_{12}, (7-19"), 18022 -- Black (10YR 2/1-2.5Y 2/1, crushed 10YR 2/1-2/2) slightly firm silty clay loam; strong medium granular to moderate very fine angular blocky; many worm casts; somewhat vesicular; pH 5.5; clear smooth boundary.

A_3, (19-24"), 18023 -- Very dark gray (10YR 3/1) firm silty clay loam; mottles are common fine and faint very dark grayish brown (10YR 3/2); moderate very fine angular blocky; common brown to dark brown (7.5YR 4/4) to yellowish brown (10YR 5/5) Fe-Mn concretions; pH 6.0; clear smooth boundary.

B_{21}, (24-29"), 18024 -- Dark gray (10YR 4/1) firm silty clay loam; mottles are many medium distinct dark grayish brown to brown (10YR 4/2-5/3); moderate fine to medium subangular to angular blocky; very dark gray to very dark grayish brown (10YR 3/1-3/2) clay-organic coatings; common brown to dark brown (7.5YR 4/4) to yellowish brown (10YR 5/5) Fe-Mn concretions; pH 6.3; clear smooth boundary.

B_{22}, (29-38"), 18025 -- Grayish brown to light grayish brown (2.5Y 5/2-6/2) firm silty clay loam; mottles are many medium distinct to prominent yellowish brown (10YR 5/7); moderate medium to coarse subangular blocky; dark gray (10YR 4/1) clay-organic coatings; many strong brown (7.5YR 5/8) Fe-Mn concretions; pH 7.2; clear wavy boundary.

B_3, (38-47"), 18026 -- Gray (2.5Y 5/1-6/1) slightly firm heavy silt loam; mottles are many medium distinct to prominent yellowish brown (10YR 5/7); weak medium prismatic breaks to weak coarse angular blocky; thin grayish brown (10YR 5/2) clay-organic coatings; common strong brown (7.5YR 5/8) Fe-Mn concretions; pH 7.5; abrupt wavy boundary.

C_1, (47-59"), 18027 -- Gray (2.5Y 6/1) friable silt loam; mottles are many medium distinct yellowish brown (10YR 5/4-5/8); massive; few small root channels; calcareous; diffuse smooth boundary.

C_2, (59-71"), 18028 -- Gray (2.5Y 6/1) friable silt loam; mottles are many fine distinct yellowish brown (10YR 5/4-5/8); massive; calcareous.

Lab. no.	Depth, in.	Horizon	Particle size distribution of < 2 mm. (in mm.) (%)							Pores		Hydraulic conductivity, in./hr.	Moisture	
			Sand	Silt			Clay			Capillary, %	Non-capillary, %		1/3 atmos., %	15 atmos., %
			Total 2-.050	Coarse .050-.020	Fine .020-.002	Total .050-.002	Coarse .002-.0002	Fine < .0002	Total < .002					
18021	0-7	Ap	1.2	34.9	32.9	67.8			31.0				35.0	16.2
18022	7-19	A12	1.1	34.5	31.8	66.3			32.6	46.9	8.2	.99	38.3	19.2
18023	19-24	A3	3.9	33.6	30.3	63.9			32.2				36.9	16.8
18024	24-29	B21	3.7	33.3	32.0	65.3			31.0	42.2	6.5	7.38	36.0	15.9
18025	29-38	B22	2.6	34.5	34.3	68.8			28.6	43.0	7.4	6.26	35.5	15.6
18026	38-47	B3	2.5	34.7	36.2	70.9			26.6				34.9	14.7
18027	47-59	C1	1.2	36.9	37.8	74.7			24.1	43.6	3.6		33.6	12.2
18028	59-71	C2	1.5	37.5	39.4	76.9			21.6				31.9	10.8

Lab. no.	Exch. cations me./100g. soil				Exch. Ca / Exch. Mg	Cation exch. cap., me./100g.	Base saturation, %	pH 1:1 ratio	$CaCO_3$ equiv., %	Organic carbon, %	Bulk density	Soil tests lb. per acre		
	Ca	Mg	K	Na								P_1	P_2	K
18021	23.2	7.0	.4	.1	3.3	32.9	93	5.7		3.22		38	104	285
18022	22.0	7.3	.4	.1	3.0	32.8	91	5.8		2.52	1.22	22	27	234
18023	20.7	7.9	.4	.1	2.6	28.5	100	6.4		1.16		12	32	225
18024	19.8	8.0	.4	.1	2.5	26.6	100	6.9		.64		11	54	200
18025	18.5	8.0	.3	.1	2.3	24.4	100	7.4		.30	1.39	8	162	170
18026	17.2	7.7	.3	.1	2.2	22.2	100	7.6	2.0	.17	1.36	12	200	156
18027	15.5	7.8	.3	.1	2.0	18.9	100	7.8	7.0	.07		18	200+	192
18028	14.6	7.7	.3	.1	1.9	15.8	100	7.8	17.0	.06	1.50	14	200+	184

Profile No. 31 — Sable Silty Clay Loam (68)

Marshall County, T.29N., R.2W., Sec. 1, SE160, NE40, NE10

Sampled in roadside at edge of cultivated field, on 0.5-percent slope to north in broad nearly level area, 215 feet south of half-mile line fence, 5½ miles east southeast from Illinois River bluff. Parent material is Peorian loess seven feet thick, noncalcareous to a depth of 60 inches. Native vegetation was sloughgrass. On-site description written and samples taken in 1957.

A_{11}, (0-8"), 18029 -- Black (10YR 1/1) friable silty clay loam; moderate fine granular structure; many roots; pH 6.8; diffuse smooth boundary.

A_{12}, (8-15"), 18030 -- Black (10YR 1/1) friable silty clay loam; moderate very fine to fine subangular blocky; many roots; pH 7.0; gradual smooth boundary.

B_1, (15-21"), 18031 -- Black (10YR 2/1) firm silty clay loam to light silty clay; moderate fine subangular blocky; roots and root channels common; pH 8.2; clear wavy boundary.

B_{21}, (21-30"), 18032 -- Dark gray (5Y 4/1) firm silty clay loam; moderate medium subangular blocky tending toward weak fine prismatic; few small Fe-Mn concretions; root channels common; pH 8.0; gradual smooth boundary.

B_{22}, (30-41"), 18033 -- Gray to dark gray (N 4/0-5/0) firm silty clay loam; common fine faint yellowish brown (10YR 5/6) mottles; moderate medium prismatic breaking to moderate medium blocky; many filled root channels; pH 8.2; diffuse smooth boundary.

B_3, (41-49"), 18034 -- Gray to dark gray (N 4/0-5/0) firm light silty clay loam; common fine distinct yellowish brown (10YR 5/8) mottles; weak coarse blocky; few root channels; pH 8.0; diffuse smooth boundary.

C_1, (49-60"), 18035 -- Gray to dark gray (N 4/0-5/0) firm heavy silt loam; many fine distinct yellowish brown (10YR 5/8) mottles; massive; few root channels; pH 8.0. A test with acid (HCl) indicated the material of this horizon was noncalcareous. A field pH recheck was read as 7.5.

Note: Krotovinas were common from depths of about 20-60", ranging from 1$\frac{1}{2}$-2" in diameter and up to 3 per square foot in horizontal cross section. The original field pH readings of all B horizons apparently were too high.

Lab. no.	Depth, in.	Horizon	Particle size distribution of < 2 mm. (in mm.) (%)							Pores		Hydraulic conductivity, in./hr.	Moisture	
			Sand	Silt			Clay			Capillary, %	Noncapillary, %		1/3 atmos., %	15 atmos., %
			Total 2-.050	Coarse .050-.020	Fine .020-.002	Total .050-.002	Coarse .002-.0002	Fine < .0002	Total < .002					
18029	0-8	A11	3.1	28.7	31.9	60.6			36.3				42.5	23.1
18030	8-15	A12	3.0	28.9	31.5	60.4			36.6	48.7	9.2	.66	39.9	21.6
18031	15-21	B1	3.3	27.7	32.4	60.1			36.6				38.4	18.9
18032	21-30	B21	3.4	27.0	37.0	64.0			32.6	37.5	9.5	16.12	36.5	16.0
18033	30-41	B22	2.7	29.8	37.5	67.3			30.0	36.1	6.0	30.56	33.6	15.2
18034	41-49	B3	2.9	33.8	36.5	70.3			26.8				31.0	14.8
18035	49-60	C1	3.8	35.5	35.9	71.4			24.8	44.3	3.6	1.01	29.8	11.5

Lab. no.	Exch. cations me./100g. soil				Exch. Ca / Exch. Mg	Cation exch. cap., me./100g.	Base saturation, %	pH 1:1 ratio	$CaCO_3$ equiv., %	Organic carbon, %	Bulk density	Soil tests lb. per acre		
	Ca	Mg	K	Na								P_1	P_2	K
18029	34.2	13.1	.6		2.6	43.9	100	7.3		4.98		40	162	300
18030	31.8	11.1	.4	.1	2.9	42.6	100	7.1		3.20	1.15	16	91	225
18031	26.8	11.0	.4	.1	2.4	34.6	100	7.5		1.58		14	101	200
18032	19.0	9.6	.4	.1	2.0	28.5	100	7.7		.49	1.36	12	140	177
18033	17.1	8.9	.5	.1	1.9	24.5	100	7.7		.32	1.43	14	200+	216
18034	14.3	7.6	.6	.1	1.9	21.1	100	7.6		.21		30	200+	300
18035	13.2	6.7	.5	.1	2.0	18.5	100	7.6		.24	1.42	36	200+	296

Profile No. 32 — Hartsburg Silt Loam (44)

Warren County, T.11N., R.3W., Sec. 27, NW160, NW40, NW10

Sampled in cultivated field on very slight rise of 0.25-percent slope to south in broad, nearly level area, about 36 rods south of road corner, 40 feet south of field fence, 30 feet east of roadside fence, and nine miles east southeast of Mississippi River bluff. Parent material is Peorian loess 13 feet thick, calcareous at a depth of 33 inches. Native vegetation was primarily sloughgrass. On-site description written and samples taken in 1964.

Ap, (0-7"), 19673 -- Black (10YR 1/1-2/1) firm heavy silt loam; moderate fine granular; pH 7.2; abrupt smooth boundary.

A_{12}, (7-13"), 19674 -- Black (10YR 2/1) firm heavy silt loam; moderate medium granular to weak fine subangular blocky; pH 7.3; clear smooth boundary.

B_1, (13-18"), 19675 -- Very dark gray (10YR 3/1) firm heavy silt loam; moderate fine subangular blocky; pH 7.3; clear smooth boundary.

B_{21}, (18-23"), 19676 -- Very dark grayish brown (10YR 3/2) firm heavy silt loam; common fine faint dark grayish brown (10YR 4/2) mottles; moderate fine subangular blocky; pH 7.3; clear smooth boundary.

B_{22}, (23-28"), 19677 -- Dark grayish brown (10YR 4/2) and grayish brown (10YR 5/2) firm heavy silt loam; few fine distinct strong brown (7.5YR 5/6) and brown (7.5YR 4/4) mottles; very weak fine prismatic breaking to moderate fine to medium angular and subangular blocky; dark gray (10YR 4/1) dull thin discontinuous clay coatings; pH 7.3; clear smooth boundary.

B_{31}, (28-33"), 19678 -- Grayish brown (2.5Y 5/2) to light grayish brown (2.5Y 6/2) firm heavy silt loam; few fine distinct strong brown (7.5YR 5/6) and brown (7.5YR 4/4) mottles; moderate medium subangular blocky; dark gray (10YR 4/1) dull thin patchy clay coatings; pH 7.4; many fine black (10YR 2/1) Fe-Mn concretions; abrupt smooth boundary.

B_{32}, (33-38"), 19679 -- Grayish brown (2.5Y 5/2) to light grayish brown (2.5Y 6/2) friable silt loam; common fine to medium distinct strong brown (7.5YR 5/6) and brown (7.5YR 4/4) mottles; weak coarse to very coarse angular blocky to massive; dark gray (10YR 4/1) to very dark gray (10YR 3/1) dull thin patchy clay coatings; calcareous; many fine black (10YR 2/1) Fe-Mn concretions; many fine white (10YR 8/1) lime concretions; clear smooth boundary.

C_1, (38-48"), 19680 -- Mixed 80% pinkish gray (7.5YR 6/2) and 20% yellowish brown (10YR 5/6) friable silt loam; common fine to medium distinct brown and strong brown (7.5YR 4/4 and 5/6) mottles; massive; calcareous; many fine black (10YR 2/1) Fe-Mn concretions; many fine white (10YR 8/1) lime concretions; clear smooth boundary.

C_2, (48-55"), 19681 -- Mixed 50% pinkish gray (7.5YR 6/2) and 50% yellowish brown (10YR 5/6) friable silt loam; common fine to medium brown and strong brown (7.5YR 4/4 and 5/6) mottles; massive; calcareous; many fine black (10YR 2/1) Fe-Mn concretions with a half inch band of yellowish red (5YR 5/6) Fe-Mn concretions; many fine white (10YR 8/1) lime concretions; clear smooth boundary.

C_3, (55-66"), 19682 -- Light gray (5Y 6/1) to light olive gray (5Y 6/2) friable silt loam; few fine to medium distinct yellowish brown (10YR 5/6) and strong brown (7.5YR 5/6) mottles; massive; calcareous; many fine black (10YR 2/1) Fe-Mn concretions; many fine white (10YR 8/1) lime concretions; clear smooth boundary.

C_4, (66-82"), 19683-4 -- Mixed 60% light gray and light olive gray (5Y 6/1 and 6/2) and 40% yellowish brown (10YR 5/6 and 5/8) friable silt loam; common fine distinct brown and strong brown (7.5YR 4/4 and 5/6) mottles; massive; calcareous; many fine black (10YR 2/1) Fe-Mn concretions; many fine white (10YR 8/1) lime concretions; gradual smooth boundary.

C_5, (82-100"), 19685-6 -- Mixed 50% light gray to light olive gray (5Y 6/1-6/2) and 50% yellowish brown (10YR 5/6 and 5/8) friable silt loam; common fine distinct brown (7.5YR 4/4 and 5/4) mottles; massive; calcareous; many fine black (10YR 2/1) Fe-Mn concretions; many fine white (10YR 8/1) lime concretions; gradual smooth boundary.

C_6, (100-116"), 19687-8 -- Mixed 70% gray and light olive gray (5Y 6/1 and 6/2) and 30% yellowish brown (10YR 5/6 and 5/8) friable silt loam; massive; calcareous; many fine black (10YR 2/1) Fe-Mn concretions; many fine white (10YR 8/1) lime concretions; gradual smooth boundary.

C_7, (116-129", 19689-90 -- Same description as C6 (100-116") except no lime concretions present.

Lab. no.	Depth, in.	Horizon	Particle size distribution of < 2 mm. (in mm.) (%)							Pores		Hydraulic conductivity, in./hr.	Moisture	
			Sand	Silt			Clay							
			Total 2-.050	Coarse .050-.020	Fine .020-.002	Total .050-.002	Coarse .002-.0002	Fine < .0002	Total < .002	Capillary, %	Noncapillary, %		1/3 atmos., %	15 atmos., %
19673	0-7	Ap	3.7	43.2	28.9	72.1	9.3	14.9	24.2				32.7	15.7
19674	7-13	A12	2.7	42.4	29.5	71.9	9.7	15.7	25.4				33.4	15.3
19675	13-18	B1	3.1	43.1	28.6	71.7	9.8	15.4	25.2				32.1	15.0
19676	18-23	B21	3.5	41.7	29.6	71.3	9.8	15.4	25.2				32.0	15.3
19677	23-28	B22	2.7	42.3	30.1	72.4	9.8	15.1	24.9				32.1	16.6
19678	28-33	B31	2.8	43.0	29.8	72.8	10.5	13.9	24.4				34.1	14.8
19679	33-38	B32	4.0	46.4	30.4	76.8	9.8	9.4	19.2				31.7	11.3
19680	38-48	C1	3.7	45.4	31.2	76.6	10.9	8.8	19.7				31.6	11.3
19681	48-55	C2	4.3	41.6	32.1	73.7	12.0	10.0	22.0				33.1	13.0
19682	55-66	C3	2.1	39.7	38.3	78.0	9.8	10.1	19.9				30.0	9.8
19683	66-74	C4	2.2	37.2	41.1	78.3	9.6	9.9	19.5					
19684	74-82	C4	2.2	34.4	43.9	78.3	9.6	9.9	19.5					
19685	82-91	C5	2.4	42.3	36.4	78.7	8.9	10.0	18.9					
19686	91-100	C5	2.5	46.4	35.5	81.9	6.9	8.7	15.6					
19687	100-108	C6	2.6	48.1	33.4	81.5	6.6	9.3	15.9					
19688	108-116	C6	2.7	48.0	34.8	82.8	7.5	7.0	14.5					
19689	116-122	C7	2.9	48.9	32.8	81.7	7.3	8.1	15.4					

Lab. no.	Exch. cations me./100g. soil				Exch. Ca / Exch. Mg	Cation exch. cap., me./100g.	Base saturation, %	pH 1:1 ratio	$CaCO_3$ equiv., %	Organic carbon, %	Bulk density	Soil tests lb. per acre		
	Ca	Mg	K	Na								P_1	P_2	K
19673	25.7	5.3	.38	.12	4.9	29.2	108	7.4		2.93		28	130+	288
19674	21.0	4.8	.29	.12	4.4	26.2	100	7.2		2.31		13	58	244
19675	18.4	3.9	.31	.10	4.7	23.4	97	7.1		1.37		7	22	208
19676	17.3	4.1	.35	.10	4.2	22.8	96	7.0		1.06		6	30	200
19677	16.8	5.0	.40	.10	3.3	22.7	98	7.1		.75		3	68	192
19678								7.6	11.0	.45		3	130+	184
19679								7.9	29.0	.30		1	18	158
19680								8.0	29.0	.27		1	10	158
19681								7.9	29.0	.23		1	21	184
19682								8.0	28.0	.19		3	28	192
19683								8.0	21.0	.23		2	36	200
19684								7.9	19.0	.23		3	15	184
19685								8.0	19.0	.16		2	22	177
19686								8.0	19.0	.12		2	34	208
19687								8.0	17.0	.12		3	120	192
19688								8.0	18.0	.12		4	130+	200
19689								7.9	14.0	.12		3	130+	217

Profile No. 33 — Ipava Silt Loam (43)

Warren County, T.12N., R.1W., Sec. 36, SE160, SE40, SW10

Sampled in roadside sod on 1-percent slope to east and to northeast, 260 feet east of quarter-mile line fence, 22 miles east southeast from Mississippi River bluff. Parent material is Peorian loess 12½ feet thick, calcareous at a depth of 57 inches. Native vegetation was tall-grass prairie. Samples taken in 1939. Description written in 1966 within a few feet of sampling site.

A_{11}, (0-6"), 15906 -- Black (10YR 2/1) friable silt loam; weak fine to medium granular; pH 5.3; abrupt smooth boundary.

A_{12}, (6-11"), 15907 -- Black (10YR 2/1) friable silt loam; moderate very fine to fine granular; pH 5.3; clear smooth boundary.

A_3, (11-17"), 15908-9 -- Black (10YR 2/1) firm light silty clay loam; moderate very fine to fine subangular blocky; pH 5.4; clear smooth boundary.

B_{21}, (17-22"), 15910-1 -- Very dark grayish brown (10YR 3/2) firm silty clay loam; moderate to strong fine subangular blocky; continuous very dark gray (10YR 3/1) to black (10YR 2/1) clay-organic coatings; pH 5.4; clear smooth boundary.

B_{22}, (22-33"), 15912-5 -- Very dark grayish brown to dark grayish brown (10YR 3/2-4/2) firm silty clay loam; common fine distinct yellowish brown (10YR 5/6) mottles; strong fine to medium subangular blocky; discontinuous very dark gray (10YR 3/1) clay-organic coatings; pH 5.4; clear smooth boundary.

B_{23}, (33-41"), 15916-7 -- Dark grayish brown to grayish brown (10YR 4/2-5/2) firm silty clay loam; common fine distinct yellowish brown (10YR 5/6 and 5/8) mottles; moderate fine prismatic breaking to moderate to strong medium subangular and angular blocky; discontinuous very dark gray (10YR 3/1) clay-organic coatings on vertical surfaces; few fine Fe-Mn concretions; pH 5.7; clear smooth boundary.

B_{31}, (41-48"), 15918 -- Mixed grayish brown and light brownish gray (2.5Y 5/2 and 6/2) firm light silty clay loam; many medium distinct yellowish brown (10YR 5/6 and 5/8) mottles; moderate medium to coarse angular blocky; patchy dark gray (10YR 4/1) clay coatings on vertical faces; many fine Fe-Mn concretions; pH 6.9; clear smooth boundary.

B_{32}, (48-57"), 15919 -- Mixed grayish brown and light brownish gray (2.5Y 5/2 and 6/2) friable silt loam; many medium distinct light olive brown (2.5Y 5/6) and yellowish brown (10YR 5/6) mottles; weak medium to coarse angular blocky; patchy gray (10YR 5/1) and light gray (10YR 6/1) clay coatings on vertical faces; many fine Fe-Mn concretions; pH 7.3; abrupt smooth boundary.

B_{33}, (57-75"), 15920-1 -- Light brownish gray (2.5Y 6/2) friable silt loam; common medium distinct light olive brown (2.5Y 5/6) mottles; weak coarse angular blocky; patchy light gray (10YR 6/1) clay coatings on vertical faces; calcareous; gradual smooth boundary.

C_1, (75-150"), 15922 -- Light brownish gray (2.5Y 6/2) and light olive gray (5Y 6/2) friable silt loam; common medium to coarse prominent brown and strong brown (7.5YR 4/4 and 5/6) mottles; massive; calcareous; sample taken at 75- to 89-inch depth.

Lab. no.	Depth, in.	Horizon	Particle size distribution of < 2 mm. (in mm.) (%)							Pores		Hydraulic conductivity, in./hr.	Moisture	
			Sand	Silt			Clay							
			Total 2-.050	Coarse .050-.020	Fine .020-.002	Total .050-.002	Coarse .002-.0002	Fine < .0002	Total < .002	Capillary, %	Noncapillary, %		⅓ atmos., %	15 atmos., %
15906	0-6	A11	.7	44.5	32.2	76.7	9.3	13.3	22.6					
15907	6-11	A12	.7	39.3	33.0	72.3	9.7	17.3	27.0					
15908	11-14	A3	.7	38.8	32.6	71.4	10.2	17.7	27.9					
15909	14-17	A3	.5	36.2	33.1	69.3	11.2	19.0	30.2					
15910	17-20	B21	.6	33.0	34.1	67.1	11.8	20.5	32.3					
15911	20-22	B21	.4	31.4	35.0	66.4	11.8	21.4	33.2					
15912	22-24	B22	.4	31.1	33.6	64.7	12.5	22.4	34.9					
15913	24-27	B22	.4	28.7	34.1	62.8	13.8	23.0	36.8					
15914	27-29	B22	.4	29.4	34.2	63.6	14.8	21.2	36.0					
15915	29-33	B22	.5	27.9	35.0	62.9	14.9	21.7	36.6					
15916	33-35	B23	.5	25.5	37.5	63.0	14.9	21.6	36.5					
15917	35-41	B23	.5	27.0	37.0	64.0	15.9	19.6	35.5					
15918	41-48	B31	.5	30.6	38.2	68.8	13.2	17.5	30.7					
15919	48-57	B32	1.0	38.1	39.0	77.1	14.2	7.7	21.9					
15920	57-66	B33	.8	44.0	40.1	84.1	9.5	5.6	15.1					
15921	66-75	B33	1.0	46.3	39.3	85.6	8.8	4.6	13.4					
15922	75-89	C1	.9	47.2	38.4	85.6	8.5	5.0	13.5					

Lab. no.	Exch. cations me./100g. soil				Exch. Ca / Exch. Mg	Cation exch. cap., me./ 100g.	Base satu-ration, %	pH 1:1 ratio	$CaCO_3$ equiv., %	Organic carbon, %	Bulk density	Soil tests lb. per acre		
	Ca	Mg	K	Na								P_1	P_2	K
15906	13.3	9.4	.33	.77	1.4	22.3	100+	5.3		3.45				
15907	14.3	4.0	.33	.09	3.6	25.4	74	5.3		2.76				
15908	12.7	4.0	.32	.11	3.2	24.3	71	5.5		2.20				
15909	12.7	4.6	.32	.13	2.8	24.1	74	5.4		1.79				
15910	12.5	5.2	.33	.12	2.4	24.4	74	5.4		1.50				
15911	13.0	5.7	.36	.13	2.3	25.0	77	5.4		1.14				
15912	14.6	6.6	.42	.17	2.2	25.1	87	5.3		.85				
15913	16.2	7.9	.46	.19	2.1	28.7	86	5.4		.64				
15914	15.7	7.9	.50	.20	2.0	28.0	87	5.4		.50				
15915	16.5	8.4	.53	.21	2.0	28.6	90	5.6		.39				
15916	16.9	8.7	.51	.24	1.9	28.9	91	5.8		.32				
15917	17.8	9.0	.57	.26	2.0	28.8	96	6.3		.25				
15918	15.8	8.3	.47	.24	1.9	25.2	98	6.9						
15919								7.3						
15920								8.0	16.0					
15921								8.0	16.0					
15922								8.0	16.0					

Profile No. 34 — Ipava Silt Loam (43)

Henry County, T.14N., R.5E., Sec. 18, NW160, NW40, SE10

Sampled in grass border at Kewanee soil experiment field, on 1-percent slope to northeast, 30 feet east and 10 feet south of northwest corner stake of Plot 309, 34 miles southeast of Mississippi River bluff, and 13 miles south from south edge of Green River basin. Parent material is Peorian loess 17 feet thick, calcareous at a depth of 53 inches. Native vegetation was tall-grass prairie, chiefly Big Bluestem. On-site description written and samples taken in 1961.

Ap, (0-7"), 18762 -- Black (10YR 2/1) friable silt loam; moderate medium to coarse granular; abrupt smooth boundary.

A_{12}, (7-17"), 18763 -- Black (10YR 2/1) friable silt loam; strong medium granular; clear smooth boundary.

A_3, (17-21"), 18764 -- Very dark gray (10YR 3/1) friable heavy silt loam; strong medium to coarse granular; clear smooth boundary.

B_{21}, (21-26"), 18765 -- Dark to very dark grayish brown (10YR 3/2-4/2) slightly firm light silty clay loam; some very dark gray (10YR 3/1) in channels; few fine faint dark yellowish brown (10YR 4/4) mottles; strong fine subangular blocky; clear smooth boundary.

B_{22}, (26-33"), 18766 -- Dark grayish brown (2.5Y 4/2) firm silty clay loam; common medium prominent brown to strong brown (7.5YR 4/4-5/6) mottles; strong medium angular to subangular blocky; clear smooth boundary.

B_{23}, (33-41"), 18767 -- Grayish brown (2.5Y 5/2) firm silty clay loam; common medium prominent brown (7.5YR 4/4) and many medium prominent yellowish brown (10YR 5/6) mottles; moderate medium angular blocky to prismatic; nearly continuous 10YR 5/1 clay films; numerous pores and root channels with 10YR 3/1-4/1 coatings; clear smooth boundary.

B_3, (41-48"), 18768 -- Grayish brown (2.5Y 5/2) slightly firm light silty clay loam; many medium to coarse prominent yellowish brown (10YR 5/6 and 5/8) mottles; weak coarse angular blocky; continuous 10YR 5/1 clay films; numerous pores and root channels with 10YR 3/1-4/1 coatings; clear smooth boundary.

C_1, (48-53"), 18769 -- Light brownish gray (2.5Y 6/2) friable silt loam; many medium to coarse prominent yellowish brown (10YR 5/6 and 5/8) mottles; very weak coarse angular blocky; thin 10YR 4/2 clay films on major faces and numerous pores with 10YR 3/1-4/1 coatings; noncalcareous; abrupt smooth boundary.

C_2, (53-72"), 18770 -- Light gray to light brownish gray (2.5Y 6/2-5Y 6/1) friable silt loam; many medium to coarse prominent yellowish brown (10YR 5/8) mottles; massive; occasional cracks with 10YR 5/2 clay films; numerous fine pores and root channels coated 10YR 3/1-4/1; calcareous.

Lab. no.	Depth, in.	Horizon	Particle size distribution of < 2 mm. (in mm.) (%)							Pores		Hydraulic conductivity, in./hr.	Moisture	
			Sand	Silt			Clay			Capillary, %	Non-capillary, %		1/3 atmos., %	15 atmos., %
			Total 2-.050	Coarse .050-.020	Fine .020-.002	Total .050-.002	Coarse .002-.0002	Fine < .0002	Total < .002					
18762	0-7	Ap	2.7	30.5	37.5	68.0	11.7	17.6	29.3					
18763	7-17	A12	2.6	27.4	37.1	64.5	11.8	21.1	32.9					
18764	17-21	A3	3.0	27.8	33.8	61.6	13.5	21.9	35.4					
18765	21-26	B21	2.9	25.2	33.4	68.6	9.8	18.7	38.5					
18766	26-33	B22	3.0	29.4	34.9	64.3	20.0	16.5	36.7					
18767	33-41	B23	1.4	25.2	40.5	65.7	13.5	19.4	32.9					
18768	41-48	B3	1.2	27.1	41.7	68.8	9.4	20.6	30.0					
18769	48-53	C1	.9	25.9	44.9	70.8	12.5	15.8	28.3					
18770	53-72	C2	1.3	34.9	42.8	77.7	10.8	10.2	21.0					

Lab. no.	Exch. cations me./100g. soil				Exch. Ca / Exch. Mg	Cation exch. cap., me./100g.	Base saturation, %	pH 1:1 ratio	$CaCO_3$ equiv., %	Organic carbon, %	Bulk density	Soil tests lb. per acre		
	Ca	Mg	K	Na								P_1	P_2	K
18762	18.3	3.7	.35	.09	5.0	26.6	84	6.1		3.07		30	125+	303
18763	14.7	4.7	.27	.11	3.1	26.1	76	5.5		2.11		12	18	226
18764	14.9	6.0	.29	.12	2.5	27.1	78	5.4		1.19		9	13	306
18765	16.2	8.0	.34	.13	2.0	30.2	82	5.4		.73		7	9	381
18766	16.6	8.4	.44	.18	2.0	28.9	88	5.5		.46		7	9	400
18767	14.8	8.0	.44	.25	1.9	25.9	91	5.5		.31		21	31	385
18768	14.1	7.8	.38	.24	1.8	23.9	95	6.0		.23		16	70	365
18769	14.6	7.7	.22	.25	1.9	22.4	100+	7.0		.15		5	125+	306
18770	14.4	8.8	.27	.20	1.6	17.6	100+	7.8	11.0	.12		3	125+	256

Profile No. 35 — Ipava Silt Loam (43)

McLean County, T.21N., R.2E., Sec. 2, SW160, SW40, NW10

Sampled in roadside bluegrass sod, on 1.5-percent slope to south, about 54 rods north of center of road corner, 28 feet east of center of blacktop road or two feet west of road fence, 34 miles east and 40 miles east southeast of Illinois River bluff. Parent material is Peorian loess six feet thick, calcareous at a depth of 49 inches. Native vegetation was tall-grass prairie, chiefly Big Bluestem. On-site samples collected and description written in 1958.

A_{11}, (0-9"), 18211 -- Black (10YR 2/1) friable silt loam; moderate fine to medium granular; fibrous roots common; pH 7.0; clear smooth boundary.

A_{12}, (9-12"), 18212 -- Black to very dark gray (10YR 2/1-3/1) friable silt loam; moderate fine to medium granular; fibrous roots common; pH 6.0; clear smooth boundary.

A_3, (12-15"), 18213 -- Very dark gray (10YR 3/1) friable heavy silt loam; moderate medium granular; fibrous roots common; pH 5.5; abrupt smooth boundary.

B_1, (15-19"), 18214 -- Very dark grayish brown (10YR 3/2) firm light silty clay loam; moderate very fine to fine subangular blocky; fibrous roots occasional; pH 5.5; clear smooth boundary.

B_{21}, (19-24"), 18215 -- Dark grayish brown (2.5Y 4/2) firm silty clay loam; mottled common fine distinct yellowish brown (10YR 5/6 and 5/8); moderate fine to medium subangular blocky; thin discontinuous dark gray (10YR 4/1) clay films; fibrous roots occasional; pH 5.5; gradual smooth boundary.

B_{22}, (24-31"), 18216 -- Mixed yellowish brown (10YR 5/6 and 5/8), pale brown (10YR 6/3), and gray (10YR 5/1) firm silty clay loam; moderate medium prismatic breaking to moderate medium angular blocky; thin continuous dark gray (10YR 4/1) clay films; fibrous roots occasional; common fine Fe-Mn concretions; pH 5.5; gradual smooth boundary.

B_3, (31-38"), 18217 -- Mixed yellowish brown (10YR 5/6 and 5/8), pale brown (10YR 6/3), and gray (10YR 5/1) firm light silty clay loam; weak coarse prismatic breaking to moderate coarse angular blocky; very thin discontinuous dark gray (10YR 4/1) clay films; fibrous roots occasional; common fine Fe-Mn concretions; pH 6.5; gradual smooth boundary.

C_1, (38-49"), 18218 -- Mixed yellowish brown (10YR 5/6), light brownish gray (10YR 6/2), and gray (10YR 5/1) friable silt loam; massive, except for an occasional vertical crack lined with black (10YR 2/1) organic material; some fine Fe-Mn concretions; pH 7.5; gradual smooth boundary.

C_2, (49-60"), 18219 -- Mixed yellowish brown (10YR 5/6), light brownish gray (10YR 6/2), and gray (10YR 5/1) friable silt loam; massive; calcareous.

Lab. no.	Depth, in.	Horizon	Particle size distribution of < 2 mm. (in mm.) (%)							Pores		Hydraulic conductivity, in./hr.	Moisture	
			Sand	Silt			Clay			Capillary, %	Noncapillary, %		⅓ atmos., %	15 atmos., %
			Total 2-.050	Coarse .050-.020	Fine .020-.002	Total .050-.002	Coarse .002-.0002	Fine < .0002	Total < .002					
18211	0-9	A11	4.0	24.9	44.8	69.7	12.5	12.5	25.0	42.3	7.9	1.71	39.2	16.2
18212	9-12	A12	3.7	22.9	45.6	68.5	12.9	13.4	26.3				34.2	13.7
18213	12-15	A3	4.7	20.6	45.3	65.9	13.2	14.6	27.8				32.8	14.1
18214	15-19	B1	3.0	19.9	42.1	62.0	15.4	18.3	33.7				32.9	16.7
18215	19-24	B21	1.8	16.3	37.7	54.0	16.7	25.4	42.1	41.7	4.6	1.74	38.4	20.7
18216	24-31	B22	1.5	17.6	38.7	56.3	14.3	26.4	40.7				39.9	20.9
18217	31-38	B3	1.5	29.0	37.2	66.2	9.8	21.6	31.4	43.7	3.2	.99	37.2	17.2
18218	38-49	C1	1.7	33.9	42.2	76.1	9.0	11.6	20.6				31.6	10.7
18219	49-60	C2	1.8	34.2	44.8	79.0	8.9	8.7	17.6	41.6	3.5	.12	30.5	9.6

Lab. no.	Exch. cations me./100g. soil				Exch. Ca / Exch. Mg	Cation exch. cap., me./ 100g.	Base saturation, %	pH 1:1 ratio	$CaCO_3$ equiv., %	Organic carbon, %	Bulk density	Soil tests lb. per acre		
	Ca	Mg	K	Na								P_1	P_2	K
18211	14.6	7.5	.5	.1	2.0	22.0	100+	7.1		3.01	1.14			
18212	9.8	5.0	.2	.1	2.0	19.0	82	5.8		1.93				
18213	9.3	5.6	.2	.1	1.7	18.9	81	5.8		1.35				
18214	11.0	8.2	.3	.1	1.3	23.0	87	5.8		1.11				
18215	13.6	12.0	.4	.1	1.1	29.4	89	5.6		.69	1.27			
18216	13.6	12.0	.4	.2	1.1	28.0	95	5.5		.51				
18217	11.7	10.4	.3	.1	1.1	21.8	100+	6.1		.45	1.41			
18218	9.7	8.2	.2	.1	1.2	13.9	100+	7.3		.23				
18219								7.8	16.8	.16	1.51			

Profile No. 36 — Ipava Silt Loam (43)

Knox County, T.13N., R.3E., Sec. 31, SW160, NE40, SW10

Sampled in roadside bluegrass sod on 2.5-percent slope to east, 1,022 feet west of road corner, three feet south of roadside fence, 34 miles east southeast from Mississippi River bluff and 26 miles south from edge of Green River basin. Parent material is Peorian loess 13 feet thick, calcareous at a depth of 70 inches. Native vegetation was tall-grass prairie. On-site description written and samples collected in 1962.

A_{11}, (0-7"), 18999 -- Black (10YR 2/1), very dark gray (10YR 2/2-3/2 dry) friable silt loam; strong fine to medium granular; roots abundant; pH 6.5; clear smooth boundary.

A_{12}, (7-17"), 19000 -- Black (10YR 2/1), very dark gray (10YR 2/1-3/1 dry) firm light silty clay loam; moderate fine to medium subangular blocky breaks to moderate medium to coarse granular; some gray (10YR 5/1) silt coatings when dry that disappear upon wetting; roots abundant; pH 6.8; clear smooth boundary.

A_3, (17-23"), 19001 -- Black (10YR 2/1), very dark gray (10YR 2/1-3/1 dry) firm silty clay loam; mottled few fine faint dark reddish brown (5YR 3/4); weak fine to medium subangular blocky breaks to moderate medium to coarse granular; roots common; pH 6.8; clear smooth boundary.

B_1, (23-27"), 19002 -- Black (10YR 2/1-3/1) firm heavy silty clay loam; mottled many fine to medium distinct dark grayish brown (10YR 4/2) and few fine faint dark reddish brown and yellowish red (5YR 3/4 and 4/8); strong fine to medium subangular blocky; black (10YR 2/1-3/1) clay-organic coatings; some Fe-Mn concretions; roots common; pH 7.0; clear smooth boundary.

B_{21}, (27-33"), 19003 -- Very dark grayish brown to brown (10YR 4/2-4/3) firm light silty clay; mottled common fine distinct strong brown (7.5YR 5/6); weak fine to medium prismatic breaks to moderate medium to coarse angular blocky; black to very dark gray (10YR 2/1-3/1) discontinuous clay-organic coatings; numerous small Fe-Mn concretions; roots occasional; pH 7.3; clear smooth boundary.

B_{22}, (33-43"), 19004 -- Mixed light grayish brown (2.5Y 6/2) and yellowish brown (10YR 5/6) firm heavy silty clay loam; mottled common fine distinct black to dark reddish brown (5YR 2/1-2/2); weak fine prismatic breaks to moderate medium to coarse angular blocky; black to very dark gray (10YR 2/1-3/1) and grayish brown (2.5Y 5/2) thick clay coatings; numerous Fe-Mn concretions; roots occasional; pH 7.6; clear smooth boundary.

B_3, (43-54"), 19005 -- Mixed light grayish brown (2.5Y 6/2) and yellowish brown (10YR 5/6 and 5/8) firm silty clay loam; mottled common fine distinct black to dark reddish brown (5YR 2/1-2/2); moderate medium to coarse angular blocky; grayish brown (2.5Y 5/2) and dark gray (10YR 4/1) patchy clay coatings; numerous Fe-Mn concretions; roots occasional; pH 7.8; gradual smooth boundary.

C_1, (54-60"), 19006 -- Mixed light grayish brown (2.5Y 6/2) and yellowish brown (10YR 5/6 and 5/8) friable silt loam; mottled common fine to medium distinct black (5YR 2/1); weak medium to coarse angular blocky to massive; grayish brown (2.5Y 5/2) and dark gray (10YR 4/1) patchy clay coatings; roots occasional; pH 7.8.

Lab. no.	Depth, in.	Horizon	Particle size distribution of < 2 mm. (in mm.) (%)							Pores		Hydraulic conductivity, in./hr.	Moisture	
			Sand	Silt			Clay			Capillary, %	Non-capillary, %		1/3 atmos., %	15 atmos., %
			Total 2-.050	Coarse .050-.020	Fine .020-.002	Total .050-.002	Coarse .002-.0002	Fine $< .0002$	Total $< .002$					
18999	0-7	A11	2.1	28.0	40.9	68.9	11.4	17.6	29.0					
19000	7-17	A12	2.7	25.1	40.1	65.2	10.2	21.9	32.1	39.2	16.6			
19001	17-23	A3	3.1	24.8	38.3	63.1	11.7	22.1	33.8					
19002	23-27	B1	2.7	24.1	35.8	59.9	13.8	23.6	37.4					
19003	27-33	B21	2.3	23.0	36.6	59.6	14.0	24.1	38.1	36.9	8.4			
19004	33-43	B22	2.2	26.9	36.7	63.6	13.7	20.5	34.2					
19005	43-54	B3	1.6	26.9	39.3	66.2	12.6	19.6	32.2					
19006	54-60	C1	1.2	33.5	39.6	73.1	9.1	16.6	25.7	43.2	3.5			

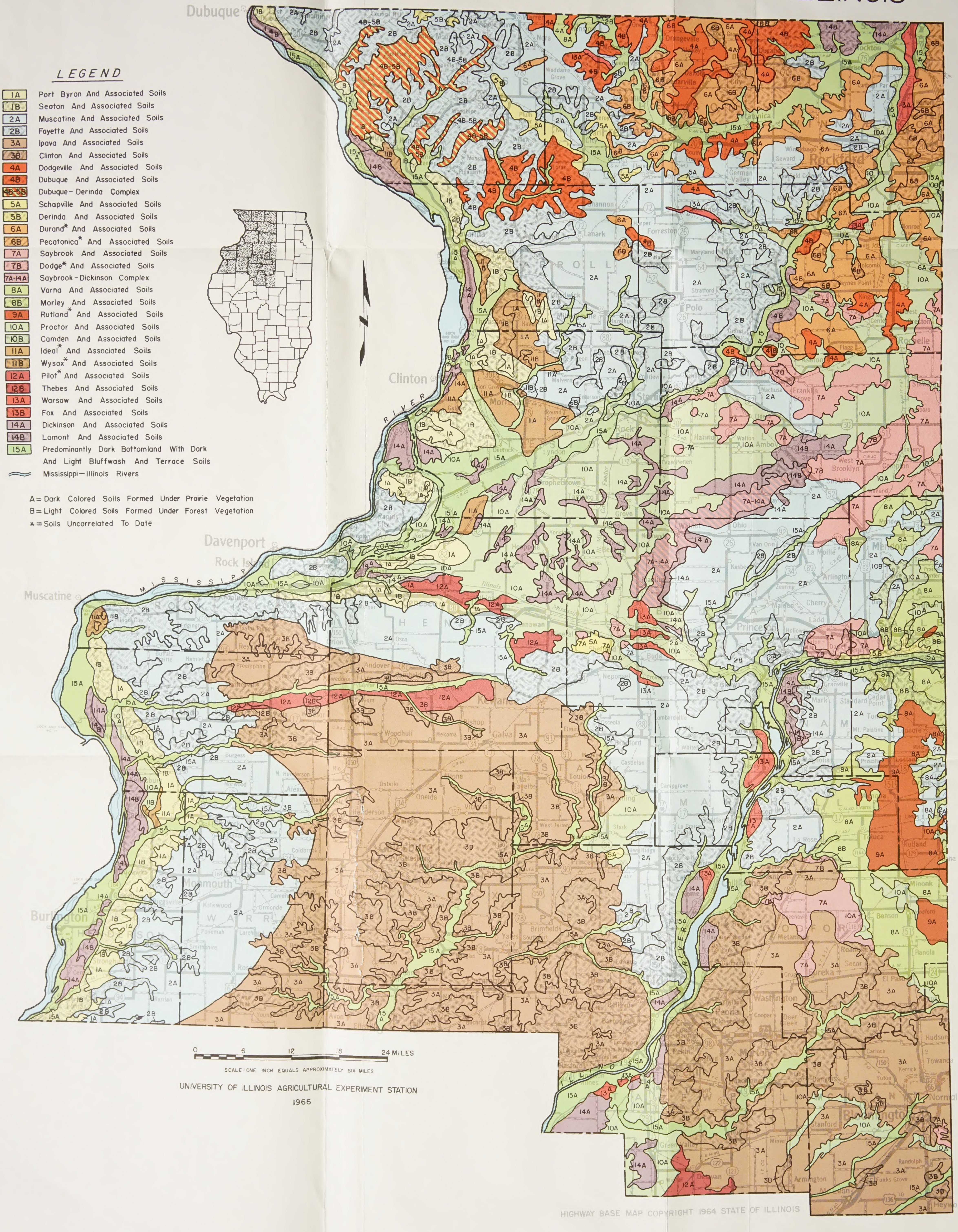
Lab. no.	Exch. cations me./100g. soil				Exch. Ca / Exch. Mg	Cation exch. cap., me./100g.	Base saturation, %	pH 1:1 ratio	$CaCO_3$ equiv., %	Organic carbon, %	Bulk density	Soil tests lb. per acre		
	Ca	Mg	K	Na								P_1	P_2	K
18999	18.7	5.0	.75	.11	3.8	32.5	75	5.9		4.69		25	44	300+
19000	18.6	6.3	.33	.11	3.0	29.9	84	6.2		2.54	1.09	9	13	216
19001	15.9	8.1	.38	.15	2.0	30.4	81	6.3		1.46		5	10	232
19002	16.9	9.5	.50	.16	1.8	30.5	89	6.3		.84		3	6	224
19003	16.9	10.3	.46	.17	1.6	30.9	90	6.4		.50	1.40	3	9	224
19004	15.6	9.8	.41	.18	1.6	28.1	93	6.6		.27		10	49	224
19005	15.5	9.8	.39	.18	1.6	26.0	99	7.1		.19		7	90	178
19006	12.7	7.7	.31	.17	1.6	20.9	100	7.4	2.0	.19	1.38	3	120+	160

3M—3-71—14604

3 0112 099150465

#439

SOIL ASSOCIATION MAP OF NORTHWESTERN ILLINOIS



LEGEND

1A	Port Byron And Associated Soils
1B	Seaton And Associated Soils
2A	Muscatine And Associated Soils
2B	Fayette And Associated Soils
3A	Ipava And Associated Soils
3B	Clinton And Associated Soils
4A	Dodgeville And Associated Soils
4B	Dubuque And Associated Soils
4B-5B	Dubuque - Derinda Complex
5A	Schapville And Associated Soils
5B	Derinda And Associated Soils
6A	Durand* And Associated Soils
6B	Pecatonica* And Associated Soils
7A	Saybrook And Associated Soils
7B	Dodge* And Associated Soils
7A-14A	Saybrook - Dickinson Complex
8A	Varna And Associated Soils
8B	Morley And Associated Soils
9A	Rutland* And Associated Soils
10A	Proctor And Associated Soils
10B	Camden And Associated Soils
11A	Ideal* And Associated Soils
11B	Wysox* And Associated Soils
12A	Pilot* And Associated Soils
12B	Thebes And Associated Soils
13A	Warsaw And Associated Soils
13B	Fox And Associated Soils
14A	Dickinson And Associated Soils
14B	Lamont And Associated Soils
15A	Predominantly Dark Bottomland With Dark And Light Bluffwash And Terrace Soils
〰	Mississippi—Illinois Rivers

A = Dark Colored Soils Formed Under Prairie Vegetation
B = Light Colored Soils Formed Under Forest Vegetation
* = Soils Uncorrelated To Date

0 6 12 18 24 MILES

SCALE: ONE INCH EQUALS APPROXIMATELY SIX MILES

UNIVERSITY OF ILLINOIS AGRICULTURAL EXPERIMENT STATION

1966

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